A Strategic Perspective on Establishing a Virtual Construction Company in the CARICOM Region

by

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B.Sc., Civil and Environmental Engineering (1993)

University of the West Indies, St. Augustine

Submitted to the Department of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degree of Master of Science in Civil and Environmental Engineering

at the

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Abstract

This thesis explores the possibility of establishing a virtual construction corporation in the Caribbean sub-region known as the CARICOM. The advent of modern information technology systems such as the Internet and groupware applications have been leveling the economic playing field in many industries, enabling small enterprises to increase their competitiveness and to lower their barriers to entry. Although the CARICOM construction industry appears to be a prime candidate for the application of these information systems, this has generally not been done. Firms have remained fragmented with limited possibilities for expansion, content rather to pursue only small local market opportunities. Although this situation is not unique to the CARICOM region, there are some specific issues involved that make the mechanization of its construction industry a more viable alternative than for other comparable developing areas. The physical separation, economic disparity, strong individualism and tenacious political independence preclude collaboration efforts by construction industry participants using conventional means. Traditional methods of communication in the region such as the telephone, fax or inter-island travel are prohibitively expensive. As a result, firms that do not possess the financial resources to set up multiple offices across the region have had to be satisfied with opportunities which present themselves in the immediate vicinity.

This thesis suggests that this dilemma could be solved by forming strategic alliances between dispersed construction-related groups located in different islands, allowing them to collaborate on suitable projects located across the region while still retaining their relative autonomy to pursue independent activities. In so doing, the organization, known as a virtual corporation, would have the flexibility to configure itself to efficiently react to market conditions.

The thesis first presents an overview of the CARICOM region, followed by an in-depth look at the existing situation of the construction industry. It then explores the characteristics of a generic virtual corporation and explains how this could be applied to construction firms. To illustrate this, the structure and operation of a hypothetical virtual construction company which uses the Internet and Lotus Notes® to link geographically dispersed units, is described. At the end, a business plan is presented for such a company.

Thesis Supervisor: Charles Helliwell

Title: Senior Lecturer, Department of Civil and Environmental Engineering
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1. The Virtual Construction Corporation: An Introduction

1.1 Modernizing the CARICOM's Construction Sector

Today, the use of information technology (IT) by organizations in their day to day activities is increasing rapidly. Indeed, for many firms, IT has become an indispensable ally in the struggle to remain competitive. Presently, however, IT usage is concentrated in the developed countries where access to the latest technology and the necessary investment capital is more readily available. The developing countries, on the other hand, have been left with little alternative but to use outmoded methods long abandoned by the more advanced territories, a situation commonly referred to as the technology gap. As long as this situation persists, organizations in developing regions will not be in a position to compete directly in the global market and this will ensure that the gap continues to widen.

Although the gap also exists between the construction industries of developed and developing countries, there tends to be much less disparity in this sector. This does not mean that in developing countries, the construction sector is any more developed than their other sectors. Rather, it implies that the construction industries in developed countries are also behind technologically in comparison to other sectors. The construction industry, therefore, represents the ideal economic activity in which to start bridging the technology gap.
In the CARICOM, there are inherent characteristics such as size, location and geography which make the need to close the gap imperative to prevent the construction industry from stagnating. One possible method of narrowing the gap and revitalizing the industry is to create a totally new type of organization structure for construction-related companies.

This thesis proposes one such type of construction organization which makes use of 21st Century technology in a way that could well become the norm in the future. It relies on electronic communication networks to help create fully integrated, temporary project teams which can exchange vital project information in real-time. Such an organization is known as a virtual corporation.

1.2 Methodology

The following four chapters examines the way the CARICOM's construction industry is presently organized, indicates reasons why this is inadequate, suggests ways that a virtual corporation structure might help to alleviate some of the problems and describes a plan for doing this. The methodology adopted is as follows:

Chapter 2. The CARICOM Region: An Overview

This chapter gives an overview of the CARICOM region. It begins by describing the history of the area and its on-going integration difficulties. Next, a profile of the area is provided which summarizes the economic conditions existing in the region. This provides an appreciation for the level of development which exists in the region.
Following this, a profile is given of five of the ten member countries which represent the range of economic development to be found in the group. Lastly, the comparative advantages to be found in the CARICOM region are discussed.

Chapter 3: The CARICOM Construction Industry

Chapter 3 looks at the important role construction plays in the area. Macroeconomic data is used to determine the construction industry’s contribution to economic development, as measured by its relationship to Gross Domestic Product (GDP). Following this, a more in-depth analysis of the construction sector of Jamaica, which is one of the CARICOM member countries, is conducted. Since it is taken as representative of the rest of the region, the findings are assumed to be typical of the other countries.

The chapter also looks at the standard methods used and some alternative contracting strategies used in the CARICOM. It also looks at how a typical CARICOM construction company is made up and ends by listing some of the difficulties caused by these methods which a virtual corporation structure would alleviate.

Chapter 4: A Better Alternative

This chapter looks at ways of applying the virtual corporation model to the construction company. It begins by defining what a virtual corporation is and listing some of its principal characteristics. It answers the question of why such an
organization is appropriate for construction firms in the CARICOM area and suggests ways of implementing such a model. It ends by describing a hypothetical virtual construction company called Virtco, which could be formed based on the theories of a virtual company.

Chapter 5: The Virtco Business Plan

This last chapter is a business plan which could be used in setting up a company such as Virtco. It is assumed that the virtual corporation formed will use the latest in IT technology to compete on a regionally basis, and will target the tourism sector. It uses current market data to conduct financial analyses and predict expected profitability.
2. The CARICOM Region: An Overview

2.1 Introduction

The purpose of this chapter is to describe the economic climate which exists in the CARICOM region. This is important if one is to understand the environment in which the proposed virtual construction company will operate.

The rest of the chapter has been sub-divided as follows: Section 2.2 gives a brief history of the Caribbean and touches on some of the problems with regional integration which have plagued the area; Section 2.3 gives a profile of the CARICOM. It includes information such as land and population distribution and other relevant statistics.

Section 2.4 provides a more detailed investigation of five CARICOM countries in order to provide a sense of the economic and social environments there.

Finally, section 2.5 examines the comparative advantages to be found in the region. It provides information on how the tourism market looks which is used later in the business plan. It also looks at critical issues associated with regional trade liberalization.

2.2 History of Caribbean Integration

The Caribbean countries have had a somewhat tumultuous history. They were “discovered” by Christopher Columbus in 1492, and since then, have been used as pawns
or bargaining chips by their respective European founders up until fairly recently. As a result, many have changed hands several times. England had the final turn at colonizing the 10 islands being considered in this thesis. They remained member countries of the British Empire until their respective dates of independence which occurred during the latter half of the twentieth century. Partly as a result of this legacy and also because of differences in size, economic well-being and cultures, the countries have had no formal relationships with each other until independence and therefore have historically found it difficult to unite. In fact, they are yet to agree on a single currency.

The first attempt at Caribbean unity was the Caribbean Federation formed in 1958. The Federation was composed of 10 of the former colonies of Great Britain which had achieved statehood status. The three largest English-speaking Caribbean countries, namely Jamaica, Trinidad and Tobago and Guyana, formed the core of this federation, and as a result, it was dissolved two years later when Jamaica decided to pull out based on a public referendum. It was quickly followed by Trinidad whose then Prime Minister in parting said "...one from ten leaves none."

In 1968, after some of the ill-feelings had subsided, the countries tried to form a loose organization centered on intra-regional trade. This was known as CARIFTA 1. Out of this evolved the CARICOM organization in 1973.

1 Caribbean Free Trade Agreement
The CARICOM was established by the Treaty of Chagaramas signed in Trinidad. The Secretariat was however located in Guyana. Among its broad objectives, the purpose of the organization is to promote intra-regional trade through reduced tariffs and regional specialization of production. The organization's mission is also to increase functional cooperation in areas such as education, health, sports, information, and so on. The realization of many of these trade objectives has remained elusive for the most part.

Despite the limited success at the trade level, there has been much success in the area of functional cooperation. There are several regionally operated institutions resulting from the attempts at Caribbean unity which continue to effectively serve the region. Some of the main ones are the University of the West Indies (UWI), the Caribbean Meteorological Organization (CMO), the Caribbean News Agency (CANA), the Caribbean Examination Council (CXC), the Caribbean Development Bank (CDB) among others.

In an attempt to foster cooperation at the sub regional level, the Organization of the Eastern Caribbean States (OECS) was established by the Treaty of Basseterre in 1981. OECS members are also signatories of CARICOM and comprise the countries of the Leeward and Windward Islands or the Lesser Developed Countries (LDCs) as they are traditionally known as opposed to the More Developed Countries (MDCs). The MDCs are composed of the countries with the largest economies while the LDCs are made up of islands with smaller economies.
2.3 Profile of the CARICOM

The CARICOM has grown to 14 member countries since its inception, the last to join being Suriname which joined in 1995. However, in this thesis, only the ten English speaking countries which originally formed the Caribbean Federation are considered. These are: Antigua and Barbuda; Barbados; Dominica; Grenada; Guyana; Jamaica; St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago. Except for Guyana which is located in South America, all the member countries are islands and lie to the East of Central America with the Caribbean Sea on the West and the Atlantic ocean on the East.

The CARICOM region has a combined land area of 234,166 sq. km with a population of 5,201,502 (see Table 2-1 for a break down of this information). From the data, it is obvious that the countries differ considerably, both in terms of size and economic development. There is no direct correlation between a country’s land area and the size of its population. For instance, Guyana which is by far the largest country, accounting for some 92% of the total area, only contributes 14% to the total population. Besides, Trinidad and Tobago, Guyana, and Jamaica, the other member countries are insignificant contributors to CARICOM in terms of both size and population (Figure 2-1 and Figure 2-2)²

² N.B. in figures 1.1 and 1.2, Bar = Barbados, Guy = Guyana, Jam = Jamaica, Tri/Tob = Trinidad and Tobago
<table>
<thead>
<tr>
<th></th>
<th>Antigua &amp; Barbuda</th>
<th>Barbados</th>
<th>Dominica</th>
<th>Grenada</th>
<th>Guyana</th>
<th>Jamaica</th>
<th>St. Kitts &amp; Nevis</th>
<th>St. Lucia</th>
<th>St. Vincent and the Grenadines</th>
<th>Trinidad &amp; Tobago</th>
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<td>280</td>
<td>430</td>
<td>748.5</td>
<td>344.47</td>
<td>214,970</td>
<td>730,000</td>
<td>10,991</td>
<td>269</td>
<td>616</td>
<td>389</td>
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<td>Population</td>
<td>65,962</td>
<td>260,491</td>
<td>71,794</td>
<td>91,158</td>
<td>2460,000</td>
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<td>664,000</td>
<td>138,151</td>
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<td>120,700</td>
<td>40,000</td>
<td>39,000</td>
<td>272,891</td>
<td>981,000</td>
<td>19,000</td>
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<td>Unemployment (%)</td>
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<td>11.0</td>
<td>18.0</td>
<td>13.0</td>
<td>17</td>
<td>13.0</td>
<td>20.0</td>
<td>19.0</td>
<td>22.0</td>
</tr>
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<td>Literacy (%)</td>
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<td>83.0</td>
<td>90.0</td>
<td>85.0</td>
<td>95.0</td>
<td>98.0</td>
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<td>Major Ports</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>International Airport</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Currency</td>
<td>EC $</td>
<td>Bds $</td>
<td>EC $</td>
<td>EC $</td>
<td>G $</td>
<td>J $</td>
<td>EC $</td>
<td>EC $</td>
<td>EC $</td>
<td>TT $</td>
</tr>
<tr>
<td>Real GDP (1989-90) (%)</td>
<td>4.0</td>
<td>-0.6</td>
<td>2.5</td>
<td>5.5</td>
<td>-2.3</td>
<td>4.2</td>
<td>3.9</td>
<td>5.4</td>
<td>6.8</td>
<td>0.2</td>
</tr>
<tr>
<td>Total GDP (US$x106)</td>
<td>101.55</td>
<td>415.05</td>
<td>59.23</td>
<td>95.36</td>
<td>324.91</td>
<td>2569.21</td>
<td>41.67</td>
<td>177.31</td>
<td>53.60</td>
<td>6143.30</td>
</tr>
<tr>
<td>GDP/capita (US$x106)</td>
<td>1539</td>
<td>1593</td>
<td>824</td>
<td>1046</td>
<td>445</td>
<td>1044</td>
<td>993</td>
<td>1283</td>
<td>498</td>
<td>4976</td>
</tr>
<tr>
<td>Inflation (1989-90) (%)</td>
<td>6.5</td>
<td>4.8</td>
<td>7.6</td>
<td>3.6</td>
<td>76.9</td>
<td>23.5</td>
<td>5.2</td>
<td>4.4</td>
<td>5.9</td>
<td>9.4</td>
</tr>
</tbody>
</table>

Table 2-1 CARICOM Member Country Profiles (1993)
Figure 2-1 Contribution of Countries to Total CARICOM Area

Figure 2-2 Contribution of Countries to Total CARICOM Population
All of the CARICOM territories are regarded as developing countries, although each unit is not necessarily at the same stage of development. Like many other developing countries, the respective governments profess their commitment to economic growth through development. The vehicle for achieving this growth tends to vary by country, however, depending on the respective factor endowments. At one end of the spectrum, islands like St. Vincent have traditionally concentrated on agro-industrial growth particularly in banana production and, as a result, have developed predominantly agriculturally based economies. At the other end, larger islands such as Trinidad and Tobago are much more dependent on heavy industries and light manufacturing. In general, the larger CARICOM countries generally possess more diversified economies, and tourism is the industry that most islands hold in common.

2.4 Five Typical CARICOM Countries

Due to the diversity exhibited by the CARICOM countries, it is difficult to evaluate the socio-economic atmosphere of the region as a whole. Consequently, this section gives an overview of the economic profiles of several countries which are believed to be representative of the group. The first is Antigua and Barbuda, a member of the Leeward Islands sub-group which derives almost all of its revenue from tourism. The second is Barbados, the smallest of the MDCs with a fairly well diversified economy mainly centered on tourism. The third is Jamaica, the largest by population which mainly concentrates on tourism as well as bauxite and alumina production for revenue. The fourth is St. Vincent which is heavily dependent on agriculture and has virtually a "one
crop economy". The fifth is Trinidad and Tobago which is more reliant on its mineral wealth and on its heavy industries for revenue.

2.4.1 Antigua and Barbuda

Antigua is the largest of the British Leeward Islands, although it only has an area of 108 square miles (280 square km) and a population of less than 66,000 people. Along with its sister island of Barbuda, it formed a twin island nation after gaining independence from England on November 1, 1981. Since then, it has been an independent member of the Commonwealth, with Queen Elizabeth II functioning as Head of State and governor-general Dr. J.B. Carlisle acting as the queen’s representative. Antigua has a bicameral legislature consisting of an elected House of Representatives and a Nominated Senate each with 17 members. Barbuda’s affairs are administered by a 9 member, directly elected council. Presently, the leader of the country is Lester Bird, who succeeded his father Vere Bird before him.

Antigua and Barbuda’s GDP grew substantially in the 1980’s before being adversely affected by the fall in tourist arrivals coinciding with a worldwide recession. Prior to this, the country had the largest tourist sector in the Leeward and Windward islands. In fact this industry has contributed as much as one third of GDP in the past. With tourists spending as much as US$238.1 million in 1989, the government undertook very ambitious building and construction programs to accommodate visitors. However, this was soon followed by a decline in air arrivals due largely to a decrease in visitors
from the USA and Canada starting in 1990. This resulted in a corresponding decline in GDP and construction for 1990 and 1991.

Some level of compensation was nevertheless provided by an increase in cruise ship arrivals of almost 25%. This was a return on investment for the Government which had constructed a port with cruise liner docking facilities in the capital city.

1993 saw an improvement in the performance of this sector with an increase in stop-over tourists. Although the number of cruise ship arrivals decreased slightly, the industry was expected to register positive growth of at least 2.5% for the 1993/94 fiscal year.

The extremely dry tropical marine climate has left the country with few options in the agricultural sector. Sugar cane production which had previously been the main contributor to GDP has declined considerably, to be replaced by produce such as tomatoes, sweet potatoes etc. In addition to this, there is limited livestock rearing, and marine activity such as lobster fishing.

In an attempt to further stimulate foreign investment in the twin island nation, legislation was passed in 1982 to encourage the development of an offshore sector offering full tax haven facilities to international business companies, trusts, banks and insurance companies. There are no capital gains, inheritance or personal income taxes, no
restrictions on foreign ownership of businesses and approved industries are encouraged with exemption from customs duty on supplies and protected by import restrictions. All these tax considerations makes Antigua and Barbuda a veritable entrepreneur’s paradise.

Although unemployment is low, restrictions on immigrant labor and the relatively high local wage costs have led to increasing inflation. The main sources of revenue are import duties, stamp duty and a 7% room tax.

Antigua and Barbuda offer export preference schemes accessing US, UK, Canadian and CARICOM markets. Since it is highly dependent on imports however\(^3\), the trade deficit is high and servicing of the external debt has given the government continued cause for concern. This has been alleviated somewhat by rescheduling processes and debt forgiveness in some cases. As a result, Antigua is able to qualify for international infrastructure development funding from various lending agencies.

A significant portion of capital expenditure (EC$170.5m of EC$233.6m total or US$63.1m of US$86.5m) has been earmarked by the government for economic infrastructure improvement over the next year. Of this, EC$132m (US$48.9m) is intended for road and airport improvements.

\(^3\) Ratio of imports to GDP totaled 81% in 1992 representing a figure of EC$800m.
2.4.2 Barbados

Barbados is the most Easterly of the Caribbean countries, lying about 100 miles from the main chain and 270 miles from the Venezuelan coast. It has a population of 257,000 people, most of whom reside in the capital city, Bridgetown. It has a similar parliamentary system to Antigua and Barbuda with Dame Nita Barrow being the governor-general. Executive power lies with the Prime Minister Dr. Owen Arthur and his Cabinet.

The island had traditionally been one of the most prosperous and stable countries in the Caribbean. However, after expanding for seven years prior to 1990, real GDP declined by 3.1% in 1990 and by 4.2% in 1991. This decrease was due to tourism, manufacturing and agriculture all recording reduced outputs over this period. As a result, a severe industrial, economic and social crisis ensued which put the Sandiford government, which was then in power, under considerable pressure by the public. The government, therefore, stated that its priority over the next five years would be to maintain a sound economy, and to strive for “economic justice” by spreading the islands wealth to the poor, making it easier to start up small businesses, and to divest some state enterprises considered to be impractical in the immediate climate.

There is a positive government attitude towards business with an emphasis on the private sector. Personal tax rates range from 20-40% and the corporate tax rate is set at 40%. There is also a Barbadian Stock Exchange. Numerous incentives have been
provided for new businesses such as 6-10 year tax holidays, losses carried forward, and dividends exempt from personal tax paid to CARICOM residents. There have also been special tax rates for international business corporations, foreign sales corporations, offshore banks and trusts. The financial services sector has also increased.

Barbados’ major imports include electrical components, food, fuel, cars, building materials, chemicals and textiles. These products are mainly supplied by the US, the EEC, CARICOM and Canada. The bulk of the exports are composed of electronic components, sugar, chemicals, rum, furniture and garments.

Like Antigua and Barbuda, tourism has been Barbados’ major growth industry and presently accounts for 16% of all jobs.

Sugar grown for export had dominated the GDP. However, the industry has been in decline due to low prices and weak demand. Production has continued to fall with 1993 recording a record low of 48,000 tonnes of cane harvested, the lowest in four decades.

The manufacturing sector is composed mainly of light industries, led by the electronics components industry followed by the production of garments, textiles and furniture. Although production in this sector has been declining recently, it nevertheless continues to be a major area for diversification and one in which investment is actively
sought. Except for the production of cement for local consumption, there is no heavy
industry on the island.

2.4.3 Jamaica

Jamaica is the third largest Caribbean island and the largest of the English
speaking islands. It has an area of 4,243.6 square miles and a population of 2.46 million
(1992). It is 600 miles South-east of Miami and 90 miles South of Cuba. The country’s
mining and tourism industries have been the base of the economy and have grown
steadily since 1980. In spite of increased production, the mining industry has faltered in
recent years due to falling world prices of bauxite and alumina. However, tourism has
prospered reaching record-breaking levels. Increases have also been recorded in the
agricultural sector. Jamaica’s economy has been aided by IMF funding following serious
economic problems during the 70’s.

Jamaica is a parliamentary democracy within the commonwealth. The Queen is
the head of state and is represented locally by a Governor General Sir Howard Cooke.
The parliamentary situation resembles that of Antigua and Barbuda and Barbados. At
present, the People’s National Party (PNP) led by Prime Minister P.J. Patterson, form the
government. Under his leadership, the general direction taken by his Cabinet is to create a
positive investment climate by emphasizing deregulation of the banking sector,
privatization, and divestment.
In 1992, the government's efforts to reduce its budget deficit and to comply with other conditions demanded by the IMF brought about confrontations as well as social and political disruptions. The government was also under pressure to stabilize the Jamaican dollar which had slipped sharply. There was also much social and industrial unrest and substantial increases in the cost of food and utilities. The 1992/93 budget contained tough economic measures and hoped to reduce inflation from 1991's peak of 106% to 16% by the end of 1992. This goal was surpassed and inflation fell to 15.5% by the end of the year. However, the quest to control the sliding dollar was not as successful. The exchange rate fell from J$22.2/US$1.00 at the start of 1993 to J$26.90/US$1.00 by the middle of August of that same year. Attempts to stabilize the dollar included expanding the number of foreign exchange dealers and floating a US$20m bond to improve inflows through authorized channels. By late September, the dollar had slipped to J$27.50/US$1.00 and inflation was increasing. By October 1995, the dollar dropped as low as J$36.00/US$1.00, a significant drop from J$0.91/US$1.00 where it was in the late 70's.

The economy grew by 1.2% in 1992 as a result of growth in agriculture, tourism and the retail trade sectors. 1993 proved to be a different story however. Growth slowed as a result of stringent monetary policies, depreciation of the dollar and a reduction in real incomes for the majority of the population. Other factors contributing to the fall in economic growth include deteriorating earnings from bauxite/alumina and high interest rates. The situation is exasperated by the heavy debt burden. Despite a reduction in the
external debt of 11.4% to US$3.68 billion, mainly as a result of debt forgiveness, debt servicing still accounts for almost 40% of the budget.

2.4.4 St. Vincent and the Grenadines

St. Vincent is located 100 miles west of Barbados. It is one of the islands in the Windward Islands sub-group. Just south of St. Vincent lies a group of 32 low-lying islands and cays known as the Grenadines. The largest of these are: Bequia, Mustique, Union and Canouan. St. Vincent is volcanic with a densely forested center surrounding Mount Soufriere, which is an active volcano.

St. Vincent is an independent member of the Commonwealth with the Queen of England as the head of State, represented by Sir David Jack, who is currently the Governor General. The St. Vincent Parliament is composed of an elected 15-member House of Assembly, and six appointed senators. The political parties are the ruling New Democratic Party (NDP) led by James Mitchell and the St. Vincent Labor Party (SVLP) led by Stanley John in alliance with the Movement for National Unity (MNU) led by Ralph Gonsalves.

The banana industry is the mainstay of St. Vincent’s mainly agriculturally based economy. In 1991, agriculture accounted for some 18% of GDP, earning EC$94 million or US$34.8 million. Production and earnings both fell in 1992 however, and again in 1993 by which time it was two thirds of what it had been in 1991. The Government’s election manifesto placed high priority on restructuring the banana industry, at an
estimated cost of EC$96 million (US$35.6 million). There was also considerable concern over the planned restructuring of EEC markets, despite assurances from Britain that St. Vincent would continue to have protected markets.

Arrowroot, a plant grown for its starch content, is the other traditional crop grown in St. Vincent. However, it has ceased to be a major contributor to the economy, with acreage under cultivation and starch production decreasing in spite of better prices. The state of this industry changed towards the end of 1992 however, due to a revival program yielding new uses for the product and consequently, cultivation was again on the increase. Although diversification away from agriculture has always been a major concern, this has been hindered by the lack of appropriate infrastructure, a problem which is only currently being addressed.

Construction is the second largest sector although lately, it has been performing poorly. Much of the industry is focused on the tourism facilities and light manufacturing which have been expanding, as well as infrastructure projects which are currently in hand. Some of the recent developments include a hydro-electric plant which has been in operation since 1994, a land redistribution program, a roads and communications project worth EC$165.5 million (US$61.3 million), and a new airport on Bequia funded by the EEC. In additional, substantial loans were agreed on in 1993 for priority improvements to roads, ports and airports.
There is a small offshore banking sector and a free zone is currently under consideration. Investment incentives include tax holidays, duty free importation, repatriation of earnings and capital, no capital gains tax and preferential access to EEC, US, Canadian and CARICOM markets. In addition, cheap bank loans are available to exporters starting at 1% below prime. Also, the currency export tax of 1% has been abolished. Furthermore, commercial banks no longer require prior approval from the Ministry of Finance to open foreign currency accounts for non-residents.

A major problem for St. Vincent has been the high rate of unemployment which has averaged between 35 percent and 40 percent in the past. At the beginning of 1993, however, the government announced that this figure had fallen to 19 percent.

St. Vincent has not historically been considered a major tourist resort, although it is seen as having great potential, particularly for sailing. Nevertheless, tourist arrivals has increased steadily since 1990. This is expected to continue as a result of the limited introduction of casino gambling. In February 1994, work began on a US$108 million tourism project on Union Island with investments coming from Europe and the Middle East.

2.4.5 Trinidad and Tobago

Trinidad and Tobago are the southernmost Caribbean islands, lying seven miles from the Venezuelan coast. Geologically, they are an extension of South America. They possess the region’s only significant oil and natural gas reserves. This has made many
other countries in the region dependent on them. Trinidad and Tobago is a republic within the commonwealth with a President, Noor Hassanali, as Head of State. Presently, the ruling party is the United National Congress (UNC) with its leader Basdeo Panday as the Prime Minister.

After several years of relative prosperity in the 1970’s based on its oil reserves, the Republic of Trinidad and Tobago fell into difficult times and in 1988 for the first time approached the IMF for funding. The economy registered a growth rate of 2.7% in 1991, however real GDP fell by 0.6% in 1992. Toward the end of the year, there were signs of further slippage and speculation of devaluation of the TT dollar were prevalent. It was feared that inflation would reach 8% by the year’s end compared with 3.8% in 1991. The decline was attributed to a reduced rate of expansion in the manufacturing and services sector, and a decline in the petroleum sector. The problems continued into 1993 with threats of strikes from the public sector, who were owed over TT$3 billion (US$511 million) in arrears.

In 1993, the government introduced a liberated foreign exchange system in which the TT dollar was allowed to float. The exchange rate fell from TT$4.25/US$1.00 to TT$5.72/US$1.00 starting nationwide panic. However, the dollar stabilized and has remained relatively stable since.

A major problem facing the government has been the control of its external debt. The Central bank remained optimistic, announcing that the long term trend of economic
decline was drawing to an end. However, by the end of March 1993, net international reserves fell from minus US$24.7 million to minus US$76.2 million in three months. Low international oil prices also continued to trouble the government. They were forced to cut over TT$200 million (US$34 million) from the budgeted expenditure in the first half of 1993 and inflation hit 17.1%.

In August 1993, the government announced their investment sector reform program aimed at improving incentives for private investment. The program received US$80 million in funding from the Inter-American Development Bank. A major component of the program was pushing through the divestment of state enterprises. 26 companies were earmarked for privatization.

The 1994 budget contained substantial new taxation measures with continued emphasis on divestment. This was to be the last year of heavy debt service payments which had totaled around US$636.5 million in 1993. The cost of these payments was an unemployment rate of 20.4%. GDP declined by 1% in 1993. However, the government forecast a real GDP growth of 0.9% in 1994. This, they maintained would lead to a reduction in unemployment.

Petroleum traditionally dominated the economy, contributing one third of the current revenue and two-thirds of the country’s foreign exchange. However, after peaking in 1978/79, production began to fall steadily. In 1992, production fell to its lowest level
since 1965. In September 1993, it was announced that Texaco Inc. and British Gas plc were expected to invest US$350 million in a major natural gas project off Trinidad's East coast.

The petrochemical sector has been performing well with production and export levels of methanol reaching record levels. There are presently two plants in operation with another scheduled for completion in 1996. This will bring total annual capacity to 1.01 million tons.

Sugar is the main agricultural export industry and is performing reasonably well. The state owned agricultural company has managed to exceed the targets set.

Tourism is considered Trinidad and Tobago's largest untapped resource. Trinidad's major tourism attraction is its Carnival, the most famous in the Caribbean. European now account for over half of all hotel tourist arrivals followed by North Americans.

The Republic of Trinidad and Tobago is a signatory to the Lome Convention, which allows duty free access to the EEC countries for industrial goods and most agricultural products, with a quota system for sugar, rum and other items.
Trinidad and Tobago was one of only three CARICOM countries included in a list of those eligible for membership of or association with the North American Free Trade Agreement (NAFTA) in 1994. The other two are Barbados and Jamaica.

2.5 Comparative Advantages of CARICOM in the World Economy

In general, tourism is the mainstay of the region. In fact, if taking into consideration all the islands in the chain, the Caribbean has the world’s fastest growing tourist industry, accounting for some 28% of its total GDP. At least 13 million tourists and nearly 9 million cruise ship passengers visit the region yearly if all the islands are included e.g. the Bahamas, Bermuda etc. The Caribbean has developed a reputation for having virtually unspoiled islands with excellent tropical marine climates and white sand beaches, and this has continued to lure visitors, especially from the US mainland.

Figure 2-3 Contribution to Total Tourism of Five Leading CARICOM Countries
Economically speaking, notwithstanding its vibrant tourism industry, the CARICOM region has relatively little to offer to the rest of the world. The CARICOM countries have traditionally enjoyed a standard of living that is higher than many other third-world countries. Because of the diaspora, with family members often spread throughout the US, Britain and Canada, they have expectations and experiences far closer to the developed world than is usually the case in developing countries. This does not help them competitively in the global marketplace, since other developing countries with lower wage rates and/or standards of living (such as Mexico) are much more attractive destinations for foreign investment. As a result, the various CARICOM islands, are currently in disarray regarding a common approach to NAFTA. This stems in the first place from different perceived gains.

On the one hand, as a result of high wage expectations and the comparatively small scale of production, islands which have been traditionally reliant on a single agricultural crop with protected markets have a lot to lose, and for them, competition in a free world market is virtually impossible.

On the other hand, countries with a manufacturing base see NAFTA as a way to expand their market base allowing them to achieve larger economies of scales. Trinidad and Tobago in particular considers wider market access in the hemisphere as critical to attracting investment. However, even among countries with strong manufacturing
economies, there are expected to be casualties, e.g. the garment industry, particularly in Jamaica.

Nevertheless, after intense debate, on the pros and cons of NAFTA entry and hemispheric integration, CARICOM governments eventually agreed to create the Free Trade Area of the Americas (FTAA) by the year 2005.

Now that there is a better understanding of the social and economic climate existing in the region to be used as the base of operations for the virtual construction company, it is necessary to get a better understanding of the region’s construction industry. This is dealt with in Chapter 3.

3. The Construction Industry in the CARICOM Region

3.1 Introduction

Before deciding the best form for a virtual construction corporation in the region, it is useful to conduct an in-depth examination of the CARICOM construction industry. This is a necessary step if one is to fully understand how the industry presently operates, and it is necessary to understand how the industry operates before the radical change in organization structure the virtual corporation calls for can be justified.
This chapter is organized as follows:

1. Section 3.2 discusses the importance of construction to the region. The contribution of construction to GDP in each island and for the region as a whole over the last decade and a half is used to gauge this importance.

2. Section 3.3 takes a closer look at the construction sector in Jamaica, which is one of the most well developed in the region. It describes the contribution of construction to the economy on the whole followed by an examination of the sub-sectors comprising the industry.

3. Section 3.4 presents typical contracting strategies employed in the region. In particular it considers the FIDIC\(^4\) construction delivery method, which is the most common one encountered in the region.

4. Next, the organization of the industry is considered (Section 3.5). This includes the organizational structure of the typical architectural/engineering and construction company as well as the inter-relationships between the various groups.

5. Section 3.6 deals with some of the problems encountered in the industry by virtue of the way it is presently organized. It considers some of the ways of improving it, setting the stage for a discussion of a virtual construction corporation in chapter 3.

\(^4\) Federation Internationale d-Ingenieurs Conseils
3.2 The Importance of Construction to the Region

The construction industry in most of the CARICOM countries tends to play a supportive role for other important industries. For instance, in the islands which are heavily dependent on tourism, such as Antigua and St. Lucia, construction is important for the creation of supporting facilities such as hotels, restaurants etc., while in other islands such as Trinidad and Tobago where industrial development plays a more important role, the largest construction projects involve the creation of the necessary industrial facilities such as factories, industrial plants and so on.

Even in this supportive role, construction is a major contributor to the region’s total gross domestic product (GDP). On average, it accounted for more than US$1 billion per year between 1980 and 1993 during which time, the total GDP of the region was less then US$10 billion per year. This represents a percentage of more than 10 percent per annum. On considering each country individually, the contribution of construction to total GDP ranged from a low of just under 7 percent in some countries to a high of nearly 12%. This information is presented in Table 3.1 which was constructed by averaging the percentage contribution of construction for each island of the 10 islands considered between 1980 and 19935.

5 Taken from the statistical yearbook for Latin America and The Caribbean (1992 and 1993 Editions) and converted to constant 1986 US dollars.
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Antigua &amp; Barbuda</td>
<td>8.86</td>
<td>101.55</td>
<td>8.73%</td>
</tr>
<tr>
<td>Barbados</td>
<td>28.18</td>
<td>415.05</td>
<td>6.79%</td>
</tr>
<tr>
<td>Dominica</td>
<td>5.27</td>
<td>59.23</td>
<td>8.89%</td>
</tr>
<tr>
<td>Grenada</td>
<td>9.84</td>
<td>95.36</td>
<td>10.32%</td>
</tr>
<tr>
<td>Guyana</td>
<td>22.98</td>
<td>324.91</td>
<td>7.07%</td>
</tr>
<tr>
<td>Jamaica</td>
<td>210.24</td>
<td>2569.21</td>
<td>8.18%</td>
</tr>
<tr>
<td>St. Kitts &amp; Nevis</td>
<td>4.87</td>
<td>41.67</td>
<td>11.68%</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>12.21</td>
<td>177.31</td>
<td>6.89%</td>
</tr>
<tr>
<td>St. Vincent &amp; the Grenadines</td>
<td>5.64</td>
<td>53.60</td>
<td>10.51%</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>716.23</td>
<td>6143.30</td>
<td>11.66%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1024.32</td>
<td>9981.19</td>
<td>10.26%</td>
</tr>
</tbody>
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Table 3.1 Average Contribution of Construction to GDP (1980-1993)

Figure 3-1, which is calculated from Table 3.1, shows the contribution of each country to total CARICOM construction. By far the greatest contributor to construction is Trinidad and Tobago which accounts for 69% of the total or US$716.23 million. However, since its construction sector is mainly industrial related, it is not representative of the region as a whole. The presence of mineral wealth and heavy industries is also responsible for Trinidad and Tobago's relatively higher value of GDP. The second largest contributor is Jamaica which accounts for 21% of the total or US$210.24 million per year.
At 10.26%, the contribution of construction is more than twice the average of 5% predicted by Movenzadeh and Hagopian in their 1983 study, which was based on a survey conducted of 34 developing countries. Furthermore, it even surpasses the 8% suggested by the same study for construction contribution to GDP in developed countries.

These findings lend credence to the fact that construction is an important economic sector in the CARICOM region and, hence, any improvement in its performance would be of significant benefit to the region’s economy. On this premise, the

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6 Bar = Barbados; Tri/Tob = Trinidad and Tobago; Guy = Guyana; Jam = Jamaica
efficiencies which may be associated with using the virtual corporation model should be looked into.

The next section provides a more in-depth look at construction in the region by focusing on a specific CARICOM member country, namely Jamaica. This island is chosen since it best represents the full range of construction activity to be encountered in the entire region. Also, Jamaica’s construction data is one of the best documented of the countries being considered.

3.3 The Construction Industry in Jamaica

3.3.1 Contribution to Gross Domestic Product

Jamaica is more diversified than all the other CARICOM countries with the exception of Trinidad and Tobago. This diversity is demonstrated in Figure 3-2, which shows the various sectorial inputs to GDP. Manufacturing and services lead the way, accounting for more than three-quarters of GDP followed by construction at just over 8%.

Basic services, which is 12% of total GDP, consists of water and electricity, contributing around 30%, and transport, storage and communications which contributes the remaining 70%.

Other services, which is the largest sector, contributing 47% of the total, is subdivided as follows:
1. Distributive trade which includes tourism services etc. contributes 40%
2. Financing and insurance contributes another 21%
3. Real estate services accounts for 15%
4. Producers of Government Services contributes 14%
5. Households and Private Non-Profit contributes 1% and,
6. Other miscellaneous services contribute the final 9%.

At 8%, the contribution of construction to GDP is more comparable to that of a developed rather than a developing country based on Movenzadeh’s study and it would be even higher (over 9%) if the last five years only are considered. However, it falls below the mean of the region which is over 10%.

![Figure 3-2 Average Contribution of Each Sector to GDP](image)

Figure 3-2 Average Contribution of Each Sector to GDP

Figure 3-3 shows a trendline of the value of total construction activity from 1980 to 1993. Between these years, it increased almost steadily from just over US$100 million in 1980 to over US$300 million in 1993. Figure 3-4 shows the trend in total GDP for the same years.
Figure 3-3 Value of Construction From 1980 to 1993

Figure 3-4 Total GDP From 1980 to 1993
Comparing Figure 3-3 and Figure 3-4, it is apparent that construction is highly correlated with GDP.

The almost steady growth rate of GDP and construction in particular was interrupted in 1985 when they both declined sharply. This decline was a result of stringent macro-economic policies adopted to curb rising inflation and a falling exchange rate. The fact that the decline in construction activity is almost double that for GDP, (8.4% vs. 4.56%) can be attributed to multiplier effects. The rapid recovery thereafter was due to the impact of service sector growth, particularly tourism accommodations, as well as growth in manufacturing. As a result of the rebound in growth rate of GDP by 48%, construction activity growth rate shot to almost 78%, which lends further support to the existence of backward and forward linkages which are responsible for the multiplier effects exhibited.

Much of the construction growth in the early 1990s was due to the rebuilding process in the aftermath of Hurricane Gilbert which destroyed the island in 1988. The overall peak in construction activity during this period occurred in 1992 when US$313 million worth of construction work was done. However, after 1992, it has been declining slightly, due mainly to the high cost of financing along with a number of other macro-economic factors. The decline might also be explained by the fact that most of the rebuilding process in the aftermath of Gilbert was substantially completed.
3.3.2 Components of the Construction Sector

Jamaica's construction industry can be broadly sub-divided into residential and non-residential construction activity. Each of these can be further subdivided into public and private sector construction. In public construction, the government assumes the role of the client whereas in private construction, the client is a private entity. Each of these are considered in turn.

Public Residential Construction

Public sector residential construction activity generally falls under one of the following categories:

1. **Housing schemes**: These are built on behalf of the government for re-sale to the private sector.
2. **Home improvement and refurbishing**: This involves additions and repairs of existing publicly owned units.
3. **Serviced sites**: In this case, the government provides the site and all of the necessary infrastructures ready to accommodate a housing unit which would normally be procured in the private sector.
4. **Settlement upgrading**: This involves regularizing of squatter settlements.

The two major players in the public residential construction segment are the Ministry of Construction (Housing), which is a governmental organization, and the National Housing Trust (NHT) which is quasi-governmental.
The NHT also provides financing in the form of mortgages in addition to the provision of construction services. One particularly successful program run by the NHT is the “Build-On-Your-Own-Land” program which provides soft loans to the private sector to purchase land for residential construction. In addition, there are other less significant contributors to public residential construction. These include the Urban Development Corporation (UDC), the National Housing Cooperation (NHC) and various private contracting firms usually sub-contracted by one of the major contracting organizations.

Private Residential Construction

The greatest contribution to the private sector construction industry in Jamaica is due to the Greater Portmore Housing Project which has been on-going since 1991. The project is supported by funding provided through the San Jose Accord and the Commonwealth Development Corporation. It is a joint venture program in which the West Indies Home Contractor’s Limited is the general contractor while the Caribbean Housing Finance Corporation (CHFC) and the NHT provide mortgage financing for the housing. The project involves the construction of starter homes (quadraminiums) studios, along with two and three-bedroom units. On average, this project contributes just over 60% of the total construction of private sector residential units, and in 1992, it surpassed 80 percent of the total.  

These statistics do not capture the activity by individuals operating within the informal sector of the construction industry mentioned on the following page.
Except for the Portmore project, private sector housing construction in Jamaica is primarily directed at middle and upper income groups since existing mortgage requirements preclude increased demand of the lower income groups. This construction is mainly done by small private contracting firms.

On average, public residential construction is the major contributor to total residential construction. In 1994, out of the total number of residential starts recorded, 2,428, public construction accounted for 2007, or 82.6%.

There is also an active “informal” construction sector which has not been taken into account in the statistics presented. This involves low-tech housing construction such as the numerous squatter units located across the island.

**Public Non-Residential Construction**

In addition to publicly owned facilities, this sector also includes public infrastructure such as roads, bridges, etc. Several public entities in addition to private organizations carry out the construction in this sector. Three main organizations were involved in most of the public non-residential projects. These were:

1. The Jamaican Industrial Development Corporation (JIDC), which accounted for US$3.12 million in factory building construction and refurbishment in 1987 under the National Factory Building Program (NFBP).
2. The Urban Development Corporation, which completed 67,800 sq. ft. of factory space at a cost of US$3.27 million for the year.
3. Ministry of Construction (Works), which conducts non-residential construction under two types of programs. These are (1) the Government of Jamaica (GOF) Fund program and (2) the Multilateral funded program. Under these programs, road maintenance typically accounts for the major part of the expenditure, followed by road construction and improvement and then bridges construction and maintenance.

**Private Non-Residential Construction**

This is mainly composed of support facilities for the tourism and commercial sectors. It is typically a vibrant sector since higher profit margins make it a more attractive sub-sector to pursue than residential construction. For instance, in 1989, it was estimated that a total US$59.51 million worth of non-residential construction was done by the private sector. A large part of this was investment into tourism facilities.

Another major contributor to activity in this sector is the Kingston Restoration Company (KRC). It was established in 1983 by a group of building societies, commercial banks, insurance companies and developers to revitalize the inner city area (the Central Business District) which has deteriorated over the last 20 years. In conjunction with the UDC, the KRC has spearheaded a multi-million dollar effort to provide production space suitable for light manufacturing use and to restore Downtown Kingston physically, economically and culturally. The total cost of rehabilitation is estimated at US$1.52 million.
3.4 Construction Delivery Methods in the CARICOM Region

3.4.1 Introduction

This section provides an overview of the construction process in terms of the principal players, their responsibilities under contract, and their interactions. Delivery using the FIDIC standard form of civil engineering contract, which is the most common contract type employed, is discussed. To begin with, other strategies which are periodically encountered in the region are evaluated. Next, the structure of a generic construction organization is considered and a description of its daily routines is given.

3.4.2 Traditional Contracting Methods Used

The construction procurement process in the CARICOM region closely emulates construction in the British system. This is a result of the legacy of British rule in the English speaking Caribbean which persists in some islands even till today. The contracting method most frequently adhered to is the one sanctioned by the FIDIC \(^8\) contract conditions. It advocates use of the Bills of Quantities (BOQ) method for allocating construction costs.

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\(^8\) FIDIC Conditions of contract for works of civil engineering construction. It is analogous to the AIA contract documents, however it is strictly applicable to construction which is measured and evaluated by the Bills of Quantities method.
The key players in this process are the principals or parties to the contract, namely the employer and the general contractor. The owner hires the project leader, which could be a civil engineer or an architect, along with various other representatives and assistants.

Due to the prevalence of hurricanes and earthquakes in the region, the civil engineer tends to play a more prominent role in the construction process than in the US, and is often chosen as project leader instead of an architect. The choice of architect versus engineer usually depends on the type of facility involved as well as the owner's preference. Projects which are structurally complex or which call for little in the way of aesthetic input such as industrial plants and school buildings would normally have an engineer as the project leader. The engineer would in turn hire an architect or draftsperson for the architectural detailing. On the other hand, projects requiring more architectural input, such as churches and hotels, would be led by the architect who hires a structural engineer to produce structural details. On the larger projects, both an architect and an engineer are normally hired by the owner, and they jointly represent the owner in all proceedings. This contracting structure is shown in Figure 3-5. In many CARICOM countries, it is now required by law that all but the smallest projects have inputs from both professions.

Also featured prominently in the construction process are sub-contractors and suppliers who enter into independent contracts with the general contractor, specialist
engineers, providers of geophysical data (e.g. surveyors, geologists and geotechnic engineers), quantity surveyors, insurers and various government agencies.

Some of the most frequently encountered contractual relationships are shown in Figure 3-5.

![Figure 3-5 Contractual Relationships in the Traditional Procurement Method](image)

3.4.2.1 The Procurement Process under FIDIC Conditions

The procurement process begins when the owner-to-be identifies the need for construction work. She then hires either an architect or engineer or both to be the designer of the facility or to form part of the design team. The design team develops plans and specifications for the facility to be constructed. As in the US, the design process typically follows a sequential process. It begins with feasibility studies followed by the design development phase which entails the conceptual design and the detailed design. The
conceptual design is generally an iterative process to determine the size, shape, location and functional requirements of the project. The owner is responsible for providing, to the design team, surveying information on which the design will be based. This is obtained from maps, if available, or else by employing the services of a surveyor.

When the conceptual design has been completed to the satisfaction of the owner, detailed design can commence during which time, final construction drawings are made. Unlike the traditional US method, in the CARICOM system, the design team is responsible for all detailing as well as for specifications. This includes plans, elevations and sections of the facility, mechanical and electrical details and site layouts done by the architect representative, along with structural detailing, foundation design, and structural material schedules produced by the engineering input of the design team.

When the design phase is completed, the owner retains the services of a quantity surveyor (QS) for estimating quantities. The QS produces the Bill of Quantities which together with the drawings, specifications and contract documents forms the bid package. Before proceeding further, the owner must obtain all the necessary legal permissions from various regulatory agencies such as the Town and Country Planning office or the Lands department.

If the contract is to be bid competitively, the owner either publicly or by pre-qualification invites contractors to bid. This is called an invitation to tender. The design
team is responsible for ensuring that all tenderers receive the same information and have equal opportunities to visit the site. During this phase, the tenderers should bring to the attention of the owner and the design team any discrepancies or ambiguities found in the contract documents.

Contractors who decide to bid must calculate a unit price for each line item in the Bill of Quantities. The unit price calculated must take into account the cost of doing the work, plus overhead and profit. If the contractor does all work in-house, the price is based on historic cost of doing similar work plus supplier quotes for material prices, plus equipment rental fees, plus labor costs. In cases where sub-contractors are used, the general contractor will obtain a quotation for doing the item of work from the sub, less the cost of material which is generally supplied by the contractor. The total bid is the sum of the line item prices, which is the unit price times the quantity. Next, each contractor must secure a bid bond and a performance bond from the bonding agencies of their choice. These protect the owners from losses which would normally occur if the contractor were to default in either the acceptance of a successful bid or during the execution phase. Payment bonds are not usually required.

The design team supervises the receipt, security and opening of the tenders. The successful contractor is not determined by lowest price only as in the US, but rather by meeting certain other requirements pertinent to the successful completion of the project. These other requirements are usually stipulated by the design team and among other
things may include contractor competence and reputation, financial soundness, familiarity with similar projects, time to completion value engineering services, etc. Hence, low price contractors are made to realize from the outset that it is a subjective selection process and they cannot take legal action against the owner if they are not awarded the contract.

After the contract has been awarded, and work begun, it is the design team’s responsibility to monitor the progress of the work and issue certificates of payment to the contractor for work completed less a percentage for retention.

The design team has authority to make minor alterations to the design as may be necessary to expedite the project. However, any substantial modifications are subject to the approval of the owner, and the contractor must be compensated for this both in terms of time and money. Upon project completion, the contractor receives the final certificate of payment and turns over the facilities to the owner.

3.4.2.2 Other Procurement Strategies

Recently, in addition to the BOQs method, new procurement methods are increasingly been employed in the region. Some of the more notable ones are:

1. **Lump Sum Contracts**: In this method, the contractor agrees to complete all aspects of the construction for a fixed sum. This sum is based on calculating all aspects of the
work involved and the cost to complete each aspect. It is similar to the BOQ method except the onus is on the contractor to determine what quantities are involved. The lump sum is the total of all the costs involved plus a percentage to cover contractor overhead and profit.

2. **Cost Plus a Fee**: In this method, the contractor agrees to perform the work for a fixed fee independent of the cost of the structure. In addition, the owner is billed for each item of the construction that is considered a reimbursable cost under the contract including but not limited to cost of materials, cost of labor and so on. As a result, if the price of the facility goes up during the construction process due to change orders for instance, this does not affect the contractor’s fee.

3. **Cost Plus a Percentage**: Cost plus a percentage is similar to cost plus a fee except that the fee for the work is a percentage of the cost of construction. As a result, if the cost of construction increases for any reason, so does the fee.

4. **Construction Management**: There are two types of construction management (CM) services provided. In one instance which will be called Type I, the owner hires a consultancy firm to manage the construction process after design is complete. This firm manages the schedule, recommends contractors, supervises the work and performs other construction services for the owner. In this case, the CM firm has a contract with the owner only, and the contractor is only a third party beneficiary to this contract. In the other type of arrangement (Type II), the CM firm closely resembles a general contracting firm in that it distributes portions of the work to sub-contractors. The main difference though is that the CM firm generally does not
perform any of the construction with its own forces but rather adds value on the basis of its construction management expertise.

5. **Multiple Primes:** In this method, the owner contracts with separate construction firms to complete different phases of the work. For instance, the foundation work may be done by a specialty foundations contractor while the site work might be done by another. In this type of procurement strategy, the owner is in effect acting as a construction manager.

6. **Fast Tracking:** In fast tracking, the construction process does not follow the traditional sequential process of a typical process. Rather, the design, bidding and the construction phases occur simultaneously. As portions of the design are completed, it is put out to bid and construction occurs almost immediately while the design team prepares another portion for bidding. This procurement strategy is generally used when the emphasis is on completing the project quickly. Fast tracking requires great coordination of design and construction since once the construction of a section is completed, it is difficult to change. Usually, the design has to be changed if there are compatibility issues.

7. **Design/Build:** In this delivery method, one firm is contracted to perform both the design and the construction of the facility. For all intents and purposes, public construction undertaken by Caribbean governments is usually done in this way. Typically, the architectural unit of the Public Works department performs the design while the construction unit does the building. If this strategy is adopted, there is no need for a bidding phase.
8. **Turnkey**: In this method, the total project is undertaken by one firm. This includes the design, financing, construction and if necessary, equipping of the facility. Complex industrial facilities, e.g. oil refineries, are often constructed in this way. Once a firm is commissioned to execute a turnkey contract, it will organize its own financing, do the design work, do the construction and purchasing, along with installing and testing the equipment. The idea is that when the project is turned over to the client, like a motor car, all that is required for the owner to do to get it up and running is to turn the key.

9. **Build Operate and Transfer (BOT)**: In build operate and transfer projects, a company is hired to do the design and the construction, provide the required financing, and operate it for a period of time to recoup costs in what is called the consessionary period. At an agreed upon time, the firm turns over the facility to the client. In many developing regions, toll roads and bridges are done in this way.

These alternative delivery methods are used to varying degrees in the CARICOM. Sometimes, the FIDIC documents are modified to permit some of these other contracting strategies, although it is more common to use totally different standards.

The occurrence of many of these new forms can be explained by the proximity of the CARICOM region to the US mainland from where many of these alternative delivery methods originate. For instance many architects, educated in the American system, due to greater familiarity, prefer to use the AIA documents in place of the FIDIC standards when they are chosen to represent the owner. Also, many companies which have come from the
US, such as ALCOA in Jamaica, may insist that all construction projects adhere to a certain standard.

The first three alternative strategies are the most prevalent alternative used after the BOQ method, and are normally used in conjunction with the AIA contract documents. They usually are preferred on smaller projects, such as residential housing construction, or projects involving US clients. In the case of the smaller projects, they are often awarded by negotiation instead of competitive bidding.

In lump sum contracts, quantities are not provided, hence the contractor must provide his or her own estimates plus calculate a suitable margin. As a result, contractors tend to dislike this type of contract since it shifts more of the risk to them than the BOQ method. When this lump sum method is called for, they tend to inflate the bid to cover their risks. Consequently, owners are wary of this strategy also for fear of receiving over-priced bids. These tend to be the projects most prone to litigation.

Owners dislike cost plus contracts since it is felt that they give the contractor no incentive to minimize costs. In fact, the cost plus a percentage might actually encourage contractors to increase expenditure. As a result these two methods are used to a lesser extent in the CARICOM.
The method of multiple primes is used fairly regularly in the region. It is mainly to be found on long projects or when the owner has had some project management experience. In some cases it is used on projects where GCs with special skills are required. A shopping plaza recently built in Antigua was constructed in this way. The foundation design was completed long in advance of the superstructure, and contractors were invited to tender a bid for the job. When the next package was ready, this was also put out for bid.

As in the US, fast tracking is used for procuring construction work when there is no time for the luxury of a full design development phase. For example, The Antiguan national stadium, the Antigua Recreation Ground, was done this way. It was to be used as a venue for an important cricket series with England, and the date had been set way in advance and was non-negotiable.

The construction management (CM) method, which has been gaining popularity in the US is used less frequently in CARICOM countries. This is an effective method for controlling complex projects with multiple prime contractors or several subs. However, the usual mentality of owners in the CARICOM region is that the CM’s services are redundant, and the designer and contractor can suffice.

Design-build contracts are also viewed suspiciously in the Caribbean. This is because the owner, who is generally inexperienced with regard to construction, has no
way of knowing whether she is getting the best design for the money. Unlike the BOQ method, the owner cannot track the cost of each aspect of the constructed work, and she does not have the benefit of a representative to watchdog the process.

BOT, turnkey projects are infrequent in the region. They are normally only used on industrial projects. The desalination plant in Antigua was a turnkey project, as were some of the industrial plants in Trinidad, Guyana and Jamaica.

3.5 Organization Structure For Traditional Construction Companies

Construction Companies in the Caribbean are structured in a similar manner to those in the US and other developed countries. A typical construction company organization chart is shown in Figure 3-6.

![Figure 3-6 CARICOM Construction Firm Organization Chart](image-url)
The upper level management typically consists of the managing director, the head of operations, the head accountant, the chief estimator, the head of procurement and so on. They are usually located at a main office which serves as a hub for information flow. Information is constantly passed back and forth between all the departments as indicated in the brief descriptions of job functions which follows.

The managing director may be the owner, if the company is a sole proprietorship, or may be appointed by the shareholders. He is at the top of the organization’s command structure and coordinates the activities of the others. In some firms, he may deal with the marketing functions and solicitation of projects.

The head of operations may be a senior construction engineer or project manager. She will usually have an office at headquarters, but also spends a large percentage of the time in the field checking projects and acting on information supplied by the superintendents. The operations head also deals with the client, architect, and engineer with whom meetings are scheduled periodically for project updates and troubleshooting.

At the head of each project is a superintendent. He is typically located permanently in the field and works out of a site office which is connected to the main office by phone and/or fax machine. Superintendents coordinate the activities on the project, and relay to the project manager information such as the need for more personnel or materials. They also usually act as time-keepers for the project crew members. This
information is relayed to the administration department for calculating the weekly payrolls and to the accounting department for keeping track of job costs.

The accounting department deals with the accounting functions of the firm. They receive information from the purchasing department and from the project manager regarding project costs. In smaller firms, the accounting department and the administration section may be combined. In this case, they also deal with payment of salaries for the salaried workers and the payroll for the wage-earning employees.

The purchasing department works closely with the estimating department, the project manager, and the administrative section within the company, in addition to the suppliers and sub-contractors without. Its principal function is to ensure materials and equipment for each project is supplied in a timely manner.

The estimating department does most of its work during the bid phase if it is a competitively bid project, or during the negotiations phase if the project is negotiated. They interact closely with the project manager and purchasing department. They also try to maintain good relations with the suppliers and equipment rental agencies in order to obtain good price quotations for materials and equipment.
3.6 Problems With Traditional Construction Delivery Methods

Although the construction methods which exist in the CARICOM today (as outlined above in sections 3.4 and 3.5) have been used for decades and are known to work, there is, nevertheless, room for improvement. Two important areas where improvements are needed include: 1) the elimination of the adversarial relationships created by traditional contracting methods and 2) the improvement of the information flows between participants. These sore spots are not limited only to construction procurement in the CARICOM, but also include procurement processes in many developed countries also such as the US and Great Britain. Section 3.6.3 also identifies some of the problem areas which are specific to the CARICOM region.

3.6.1 Adversarial Relationships

Traditional contracting strategies have developed the reputation of encouraging adversarial relationships between project participants. It is generally a zero sum game as opposed to a win-win relationship. An examination of any FIDIC or AIA contract specification reveals that each is filled with stipulations for assigning liability, punishments for poor performance and so on. In the US construction industry especially, suits for breach of contract, for negligence, on the basis of implied warranties, strict liability, third party beneficiary and so on are common place.

For instance failure to give due notice to architects and owners can result in loss of compensation rights for ambiguities discovered in contract documents. In some cases,
contractors are asked to sign contracts to accept all the risk of the cost of change orders during construction, whether or not the contractor had anything to do with it.

Also, the traditional bidding process is designed to get contractors to commit to prices for construction services based on estimated costs, usually completed in one and a half months. Very often, many of the components of the work to be done are inherently unknown at the time of bidding, e.g. subsurface or other hidden conditions. To protect themselves, the approach normally taken by contractors is to inflate their bid price.

This problem of adversarial relationships is compounded by the fact that very often, project teams are formed on a one time basis and thus have little incentive to cultivate a good rapport with other project participants. This causes a fundamental lack of trust among project participants. The owners feel that contractors require constant supervision or else they will try to cut corners. The contractors feel that the owner and design team is trying to cut into profits by making unreasonable demands.

3.6.2 The Flow of Information

One of the problems with traditional construction organizations is that the complex inter-relationships based on organizational hierarchy and contractual relationships have the tendency to prohibit effective communication between project participants. The usual method of information transfer is anything but real-time. Memos and official letters are used to request information which is returned via more memos and
letters. Also, large amounts of duplication is often required in order to ensure participants are working with the same information. For instance, several copies of the project drawings are usually present at any given time. The design team, owner, quantity surveyor and the general contractor all need complete copies from which to extract only a small amount of information which is relevant to them. When changes are made, they take time to filter down to other team members. Hence, at any given time, participants may be basing their work on conflicting information.

Figure 3-7 shows the direct path of information flow superimposed on the diagram of contract relationships from Figure 3-5. It is a direct path diagram because lines link participants who require information directly to the persons from whom this information is required as opposed to linking all the intermediaries who must relay the information. The diagram looks complicated because the process is. It should be noted also that in reality, it is even more complicated since the figure only concentrates on information required by the general contractor and those with whom he has a direct contract. In actuality, any project participant might require information from any other participant forming a much more complicated diagram.
In the diagram, the GC requires project specific information from engineers, architects or other members (shown by the solid lines). The same goes for the subs, suppliers and sureties indicated by the dashed lines. (Contractual relationships are denoted by the dotted lines). However, information rarely flows in direct paths as suggested in the diagram. Rather, project participants are usually required to formally request information from persons with whom they have a direct contractual relationship, fully documenting the process as they go to avoid litigation. Therefore, it is fairly commonplace for projects to be delayed as a result of time-sensitive data being relayed too slowly. A classic example is the submittal/approval process for shop drawings.
The inefficiencies in information transfer is also a problem at the intra-firm level. Indeed, it is customary for employees in various departments to form cohesive bonds with other members in the department with whom they work closely. This leads to the formation of informal information centers. On the other hand, adhesive bonding between departments tend to be less well developed. For example, although superintendents know every aspect of their project, they generally have no idea how their project contributes to the well-being of the entire company. Also, it is customary for employees operating at the periphery of the company border to develop stronger ties with employees at the periphery of other organizations with which they come into regular contact, than with other members of their company which they encounter infrequently. For instance, persons responsible for procurement often have better relationships with the suppliers whom they deal with daily than with other employees in the field for instance.

3.6.3 Problems Specific to the Construction in the CARICOM

In addition to the general problems with the traditional construction process as explained in the two preceding sections, there are two main issues related to the construction industry that are unique to the CARICOM region.

Firstly, the CARICOM territories are geographically separated and inter-island travel is expensive. As a result, a traditional construction company targeting regional markets would have high communication costs, using basic communication tools like the telephone and the fax machine. Also, the resources of the company would need to be duplicated at each location since it would be virtually impossible to share resources on
one island with a project located on a different island. For instance, if estimating services are required for a project in Barbados, it will be necessary to have an estimating department in the Barbados local office even if at the same time there are estimating departments in Jamaica, St. Lucia and St. Kitts which are currently idle.

Secondly, the demand for construction in the CARICOM is unevenly and unpredictably distributed among the islands. A company based in only one island would have a much greater exposure to risk due to declines in construction activity than if the company had an established presence in several islands. Periods of economic growth and recession in CARICOM territories very often occur at different times so diversifying operations in several countries would reduce some of the unsystematic risk. On the other hand, a regional construction company with fully established branch offices in different islands faces the risk of high overhead costs associated with the maintenance of multiple offices as well as the risk of underutilized staff.

The next chapter therefore argues that a virtual corporation structure, would provide a viable solution for the unique situation found in the CARICOM, as it allows a company to be formed which transcends many of the problems associated with the economic, geographical, and cultural differences. It is also conceivable that a structure can help to alleviate many of the other problems characteristic of the industry.
4. The Virtual Corporation Alternative

4.1 What is a Virtual Corporation?

Recently, there has been immense interest in reorganizing businesses in some of the industrialized countries in order to increase their efficiency. Many management experts are suggesting that a radically different type of structure should be adopted which focuses on strategic alliances and temporary joint ventures. The phrase ‘virtual corporation’ is used to describe such an organization.

According to Byrne et al. *(Feb. 8, 1993)* although the concept of a virtual corporation has been attributed to many different management consultants, the phrase was most likely coined by Jan Hopland, an executive of Digital Equipment Corporation. He used the term to describe an enterprise that can muster more resources than it has on its own by using collaborations both inside and outside its traditional company boundaries. By doing this, it is able to distribute costs, and share skills as well as access a larger aggregated market base, with each partner contributing what it is best at. Such an enterprise is described as being virtual because of its similarity to a computer’s virtual memory which allows it to act as if it has more storage capacity than it really does.

One large US industry which operates in this way is the movie business. Since the collapse of the old Hollywood studio system, movies have been made by virtual corporations. Various groups possessing independent talents come together for a specific
project and then go their separate ways afterwards. It is likely that part of the immense success of the movie industry may be attributed to efficiency of its virtual corporation structure. The way that the construction industry operates also approximates a virtual corporation. However, for reasons which are explained later in this chapter, it has been much less effective.

Along with many originators, the phrase ‘virtual corporation’ also has several definitions. According to Internet World, *(July 1995)*, a virtual company is one in which no one works in a single location and all workers communicate across a network (such as the Internet). Others such as William Davidow and Michael Malone⁹ use the phrase to encompass a slew of management buzzwords and ideas ranging from worker empowerment to just-in-time inventory techniques. Still others such as Roger Nagel, a famous management guru, define a virtual company as a collaboration of groups or sub-entities using IT based applications to execute a wide array of temporary alliances with other industry players. According to Nagel, its sole purpose is to grasp specific market opportunities and after these goals have been achieved, the group usually dissolves.

The virtual construction corporation which is described in this thesis is similar to the model in Nagel’s definition. The main difference however, is that the alliances formed between key groups are normally more lasting than those suggested in Nagel’s model. The sub-entities are capable of functioning on their own in the market segment related to

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⁹ Authors of ‘The Virtual Corporation, Structuring and Revitalizing the Corporation For the 21st Century’
their specific area of expertise and may be required to do so at times. However, their real value-adding potential is as part of the larger team.

4.2 Characteristics of the Virtual Corporation

Many of the studies which have been written on virtual corporations suggest certain characteristics which these organizations should possess if they are to be effective. Although opinions on this subject differ, there appears to be a consensus on some of the key attributes necessary. Discussed below are five such attributes which best describe what a virtual corporation entails.

4.2.1 A High Level of Trust is Required

There is almost unanimous agreement among experts who have studied the virtual corporation model that trust is a key component for participating team members to possess. The reason for this is that strategic alliances, which form the backbone of the virtual corporation, demand far more confidence in the abilities and objectives of others than conventional supply and demand based alliances do. An important fact to keep in mind is that to an observer looking in from the outside, a virtual corporation should appear to be one large seamlessly integrated company. Therefore, failure by any team member would be seen as a failure of the entire corporation, which in turn causes the reputation of each team member to suffer.
This should not be taken to mean that there is no need for contracts between participants in a virtual organization. Legally binding contracts will still be necessary to regulate how team members operate. However, contracts alone cannot take the place of trust to guarantee quality performance in a virtual corporation. For one thing, in many instances, contracts encourage adversarial relationships between parties. Also, drawing up the required documents can be time consuming and hence, undesirable in time-sensitive projects. Furthermore, contracts often attempt to shift responsibility from one party to another, while in the virtual model, the emphasis should be placed on reducing the overall liability. Hence, in the ideal virtual corporation, business agreements become analogous to marriage covenants, i.e. the quality of the relationships are more important than the contracts in and of themselves (Computerworld, Jan 30, 1995).

In situations where suppliers or owners are members of the strategic alliance, there must be a willingness to share information which benefits the entire project even if it does so at the expense of an individual team member’s ability to gain competitively over the others. According to Esther Dyson, president of EDventure Holdings and recognized industry watcher, the two-way flow of information is the best cement for a virtual corporation. She maintains that companies find partners not just by offering discounts but by sharing information about themselves. In her article, Dyson refers to an industry conference in which the president of Microsoft’s European division, Bernard Vergnes discussed Microsoft’s changes in structure and strategy for the future. Although most of the audience was composed of dealers with no real affiliation to Microsoft, by
sharing information with them, Vergnes made them feel like partners (Computerworld Jan. 30, 1995).

On the other hand, although such dialogue is all well and good, there also exist the real danger that proprietary information or technology might escape to potential competitors, such as was the case when IBM joined with Microsoft Corporation and Intel in order to bring the first PC to market more quickly (Business Week, 1993). At first, IBM won widespread praise for its unprecedented decision to develop a major product with others outside the company. However, this approach also meant that the system was not proprietary and IBM soon found that it had created a market that it could not control. Shortly thereafter, hundreds of competitors had emerged with lower prices and better products.

The trust which is being advocated here, therefore should not be confused with blind faith in all companies within one's value-chain. Rather, what is being suggested is that team members who agree to form a virtual corporation should be selected based on shared goals and values and should have a proven record of trustworthiness. Once these criteria are met, win-win deals can be more easily negotiated between parties, leading to mutual benefit for all.

4.2.2 A Virtual Corporation Surrenders Control for the Sake of Excellence

Another important requirement is to establish the right balance of freedom and control. Each sub-entity of the virtual corporation must be prepared to relinquish some
control of key activities to other members of the team specialized in that area. Hence, the success of the corporation and its projects would be a function of the quality of all its members. To maximize its effectiveness, the component groups of the virtual corporation should collectively possess the full range of capabilities, knowledge and resources needed for the specific project. To ensure that this is the case, Byrne suggests that component groups should be stripped to their very essence, discarding all activities not associated with their core competencies. An example of a company which does business in this way is TelePad, producers of hand-held pen-based computers.

TelePad was founded by Ron Oklewicz, formerly of Xerox Corp. and Apple Computer. It has limited in-house design talent, a handful of engineers, and no manufacturing plants. The computer TelePad produces was designed and co-developed by GVO Inc., a prominent industrial-design company. An Intel SWAT team was hired to iron out some of the engineering kinks. Several other companies have developed software for the product. A battery maker collaborated with TelePad to make the portable power supply, and the company uses spare capacity at an IBM plant in North Carolina to manufacture the computer. The paychecks for its employees, are issued by an outside firm called Automatic Data Processing Inc. The value added by TelePad in this process is the founder’s experience in selling computers to the US government, which is one of its key customers. According to Oklewicz, his virtual organization avoids many of the inefficiencies and costs of vertical integration while leveraging the resources of world class partners in the development of the product (Business Week, 1993).
The downside, however, is that increased trust in partners external to the organization results in less internal control, which in turn often leads to coordination problems. This has proved to be one of the major stumbling blocks to re-engineering many large vertically integrated firms in the past. These companies are afraid that by giving up control of key functions they stand the risk of being let down by incompetent partners. In the case of TelePad, they were lucky to have formed alliances with highly competent firms. In other examples, this has not been the case, as demonstrated by Intel’s experience in a collaborative effort with two Japanese companies.

Intel Corporation attempted to form strategic alliances with two Japanese companies, namely NMB Semiconductor and Sharp. Unfortunately, NMB Semiconductor proved to be the weak link in the collaborative effort and the end result was a longer than anticipated development period (Business Week, 1993). This has led Andrew Grove, the chairperson of Intel, to conclude that a virtual corporation is simply a meaningless “business buzz phase”, although he concedes that there is merit in collaboration.

Another example of a failed alliance due to surrendering of control was evident in the case of AC International, a producer of bicycle accessories (Inc. 1994). Like TelePad, by outsourcing almost all of the key activities, including manufacturing, packaging, marketing and product development, they had placed themselves at the mercy of the other team members. These members failed to produce and so AC International had to assume
control of these activities in-house. This was accompanied by a significant increase in both productivity and profit.

What can be learned from these last two examples is that surrendering control is often a risky undertaking. This is especially true for large vertically integrated companies accustomed to doing things in-house, which attempt to outsource certain activities. Nevertheless, it appears to be a key attribute in many successful virtual corporations.

4.2.3 A Virtual Corporation is Information Technology Intensive

Another important aspect of the virtual corporation is that team members should be able to communicate with each other and transfer information in real-time. If this is not the case, the collaboration will be at a disadvantage to traditional companies which have all of their functional groups either located within the same building or already tied together with a comprehensive communication system.

In regard to the use of technology in the virtual corporation setting, there are two main organization structure scenarios it may be applied to (See OR/MS Today, August 1995). In one scenario, the virtual corporation could be composed of an assemblage of smaller companies. These smaller companies might be; 1) equal partners, 2) a prime systems contractor and major component sub-contractors, or 3) the equivalent of the Japanese keiretsu - an ongoing coalition of contractors working on a particular product over time. The arrangement often involves individual companies working in remote locations relative to each other, but being able to communicate with other team members
via conventional real-time communications devices such as the telephone and the fax machine, or quick-time methods such as courier services. However, more and more companies are shifting to the latest technologies such as E-mail and electronic data interchange (EDI), made possible by modern groupware applications providing the graphical user interface (GUI) and wide area networks (WANs) such as the Internet providing the connectivity.

Cable and Wireless Offshore Keyboarding Corporation, a data-entry outfit based in Barbados, operates in this way. Originally, the company received books, dictionaries, magazines and other manuscripts from publishers in the US and Great Britain, and returned the documents by courier. Nowadays however, the company is increasingly coming to rely on transmission via satellite and modem, which allows them to ‘tele-transport’ documents overseas.

Within the sub-units, the level of information technology employed is a function of the type of business involved and the degree of additional sophistication required. This is normally decided by a company’s MIS department. At the very least, internal communications for a typical business are necessary for passing documents, distribution of organizational news, employee relations etc., and may be done using telephones, faxes, intercoms, inter-departmental memos or on a person-to-person basis. The typical construction firm operates in this way. On the other hand, the sub-units could be just as sophisticated and IT intensive as any advanced corporation. Large vertically integrated
engineering and construction companies like Jacobs Engineering Group operate in this way. Along with phone, fax and intercom, networked computers tend to play a much more important role in everyday inter-office communication. The Internet can also be modified to serve this purpose. A “virtual private network”, which acts like a local area network (LAN), can be created using the Internet in conjunction with various encryption services allowing only those in the dedicated group to “see” each other despite the Internet’s lack of security.

In the second scenario, if the concept of ‘virtuality’ is extended even further, the sub-entities may be organized as virtual offices, permitting workers to telecommute. This can result in a substantial reduction in overhead costs. One such example is VeriFone, a $260 million company and the world’s largest supplier of electronic credit-card verification equipment. (OR/MS, Aug. 1995). It can be considered the quintessential company without an office. Although the company does have an official headquarters in Redwood City California to comply with Securities and Exchange Commission requirements, for each employee, the office is wherever is practical on a given day. The only requirement is a phone jack in order to connect the laptop computer with the firm’s mainframe computer via modem. The dispersed structure is not limited to lower and middle management, but extends to all levels of staff. For example, VeriFone’s CEO spends 80% of his time on the road. Its senior vice-president for operations is located in suburban Los Angeles, The human resources director is based in Dallas, and the chief
information officer lives and works in Santa Fe. To maintain some form of human contact, they meet in person every six weeks.

VeriFone’s long-distance operating style would be impossible without its computer system which makes every shred of corporate information available on-line, or its management culture which embraces the use of computers for almost every task (Business Week Oct. 1994). Paper memos are banned in VeriFone. Rather, its 1,800 employees communicate primarily through E-mail using a dedicated wide area network (WAN). The WAN is composed of Digital Equipment Corporation’s VAXs and leased lines. Almost no one has a secretary but everyone has a laptop.

The main idea behind VeriFone’s virtual structure is to create a firm that is close to its customers. However, it has an added advantage in that it is capable of making time zones work for the company rather than against it. For instance, VeriFone’s managers can and often do pass projects from one continent to another to keep them on track and on time. When a team in one time zone has finished for the day, the project is transferred on-line to a team working in a different time zone who can work on it further.

In between the two extreme scenarios described above exist virtual corporations with organization structures which are somewhere in the middle. That is to say, some of the sub-units might have a virtual structure, while others operate as traditional companies.
4.2.4 A Virtual Corporation is Motivated by Opportunism

Virtual corporations are by nature opportunistic in that they band together to capitalize on some temporary market opportunity usually only to disband once the need is satisfied. This is supported by Eisenhardt’s Agency Theory, which states that human beings are motivated by self-interest rather than altruism or commitment to organizational goals. However, although founded on self-interest, in reality, as discussed above, much team spirit and unselfish behavior is required among the team members if it is to work properly. Very often, a successful collaborative effort which is initially motivated by opportunism leads to a longer term strategic alliance targeting new opportunities.

Strategic alliances by large blue chip corporations with start-ups, (e.g. AT&T’s partnerships with Go Corporation for the development of pen-based operating software) are examples of opportunism in action. The smaller company can capitalize on its larger partner’s economies of scale advantages and financial strength, while the larger company benefits from the smaller company’s flexibility and quicker response time. Many corporations are also motivated to form alliances by marketing and manufacturing considerations (The Futurist, March-April 1994). Some form joint ventures with foreign partners (or even competitors) to gain better coverage of international markets or to take advantage of reduced labor and delivery charges in other countries. The construction industry again provides several concrete examples of such alliances. For instance, Fitzpatrick Building, a British company which primarily pursues highway infrastructure projects recently entered into a joint venture with Geotech Associates, a local
geotechnical consultancy firm in Antigua, to undertake a major road improvement project on the island. The contract involved the reconstruction of 4.4 km of roadway between the capital St. John’s and a new tourist development known as Jolly Harbor. It was a win-win joint venture. Fitzpatrick Building benefited from bringing on board a company experienced in local construction industry practices, while Geotech benefited from the added credibility and financial backing the alliance gave them. It is unlikely that either company would have won the contract if they had attempted to bid independently. The success if this initial joint venture has prompted the two companies to form a more lasting relationship, and they plan to pursue more infrastructure project opportunities in the CARICOM region.

4.2.5 A Virtual Corporation is Borderless

Finally, the ideal virtual corporation redefines the traditional boundaries one might expect to find in a company. It often necessitates greater cooperation among competitors, suppliers, and customers and this makes it harder to determine where one company ends and another begins. Furthermore, it gives companies added flexibility to expand or contract almost instantaneously by associating or disassociating with other team players upstream, downstream or horizontally in the value-chain.

The auto industry, one of the most competitive businesses, provides a good example of the how companies extend beyond traditional borders to benefit from some unique advantage. For example, these days, it is becoming more commonplace to find
“American” Ford automobiles which are designed in Europe with Japanese built engines, assembled in Korea and sold in the Caribbean.

In the Caribbean, the American based AT&T teamed up with the British telecommunications company Cable and Wireless to digitally link some of the Caribbean islands. Although they are competitors for the provision of telecommunications services in the region, working together, they have spent more than $180 million on fiber optic cables linking Colombia, Jamaica, the Dominican Republic and Florida. Both companies seek to digitize the islands to capitalize on the expected boom in data-entry operations in the near future.

4.3 Why a Virtual Construction Corporation is Ideal for the CARICOM

There are similarities between how the construction industry and virtual corporations operate which would suggest that it should be relatively simple for the construction industry to adopt a virtual corporation structure. Listed below are the five major ones.

1. They both involve dynamic processes. The work atmosphere is continuously changing, both at the project and the organization level. As a result, the automation of work processes and quick communication enabled by the IT intensive nature of virtual corporations should be extremely useful in the construction industry.

2. Both processes are based on complex interrelationships among the various participating entities. IT can reduce the need for bureaucracy and hierarchy in organizations and can enhance interaction of organizational activities.
3. Both rely on team-work. Similar to the team-based virtual corporation, team-work is required to construct a facility successfully. As a result, organizations involved in construction are project oriented and ad hoc teams and/or networks are usually formed. Through IT, virtual corporation structures can be used to facilitate team building, overcoming the barriers of time and space.

4. Operations in the construction industry are people intensive and cannot be completely automated or mechanized. In general, the product-line concept used in traditional manufacturing is not applicable to the construction process. Technologically advanced virtual corporations will allow people to communicate in a flexible atmosphere by relieving them from routine work. The virtual corporation model could also facilitate the coordination of activities of a project's many specifications.

5. The solution of construction project problems are highly dependent on the experience and judgment of professionals. They involve a high degree of uncertainty and reliance on other "expert" participants to make judgments calls and control special aspects of the project. Likewise, the most effective virtual corporations outsource key components of its operations to project participants which are more versed at performing these operations.

This might lead one to assume that it should be easier to create a virtual company in the construction industry than in most other industries. However, there are some important differences which might negate this assumption. The main one is that unlike virtual corporations in which teams are formed by willing participants who have
recognized complementary core competencies in each other, construction industry project teams are thrown together in an ad hoc manner based on a crude selection process which relies on low cost and ignores synergistic potential. From the contractual relationship diagram shown in Figure 3-5 in the preceding chapter, it is apparent that although there are legal relationships between the design team and the owner as well as between the general contractor and the owner, there is no such contract between the design team and the GC. In fact, the FIDIC and AIA contract documents insist that this be the case to “protect” the owner’s interest. On the other hand, the design team and GC both have information which is critical to each other’s operations to the success of the project. The virtual corporation model would suggest that the design team and the contractor should join forces for their mutual benefit. This is in keeping with the requirement that the virtual corporation should develop trust in other participants and be borderless.

To fully convert a construction organization structure into a virtual corporation structure, it would be necessary to break down many of the barriers to open communication that exist and emphasize the team building mentality. IT would need to play a much greater part in construction organizations in order to facilitate real-time communication and to ensure all participants are supplied with the same information at all times. Also, mutual adjustment should replace direct supervision as the mechanism coordinating team behavior.

10 Mutual adjustment and direct supervision are two of the five coordinating mechanisms explaining the way ways organizations coordinate work as suggested by Henry Mintzberg in his book The Structuring of Organizations. The other three are standardization of work processes, standardization of work outputs and standardization of worker skills.
Many of these radical changes needed are unlikely to be seen in the US construction industry in the near future. This is because construction in the US is characterized by strict methods for doing things and set business practices which players in the industry are unwilling to change. Although IT usage in the US construction industry has increased drastically over the last few years, in most cases, it is used to automate existing practices as opposed to creating new ways of doing things. Also, the fact that the industry is highly fragmented and thus very competitive in addition to being extremely litigious, adds to the incentive of the various groups to hoard information to protect their competitive positions. All of this is at the expense of the project which suffers due to the tug-of-war relationships between participants.

It is conceivable, however, that a virtual construction firm would be easier to establish in the CARICOM than in many other regions for the following reasons.

1. In the CARICOM region, competition is not as intense as in the US and hence profit margins are typically higher. As a result, there is less likelihood that competitive position would be threatened by open communication. Consequently, the various professions would be less averse to sharing information.

2. The society is much less litigious. Since populations are relatively small, there is a greater desire for contractors to foster long term relationships with owners so partnering solutions are generally the preferred method to resolve conflicts.
3. There are fewer restrictions on procurement strategies which can be adopted in the public or private sector of CARICOM countries. Hence, a public project could just as easily be awarded as a design/build contract as it could using the traditional method. This is in contrast to the US where federal contracts must be awarded on a competitive low bid basis, and where collaboration between the various project participants is prohibited in many cases.

Much of the necessary telecommunication infrastructures which is required to make such an undertaking feasible is already in place in most of the islands. Most of the island have access to the latest in digital communication service. This is mainly through the efforts of Cable and Wireless, a British telecommunications company responsible for long distance service for most of the CARICOM. They also provide access to the Internet in several islands such as Antigua and Barbados.

A virtual corporation structure, therefore, provides a viable solution for the unique situation found in the CARICOM construction industry. It allows a company to be formed which transcends many of the problems associated with the economic, geographical, and cultural differences in the region.

The next section considers the form such an organization could take. It does this be describing as realistically as possible how a virtual corporation by the name of Virtco would be organized and how it would operate.
4.4 Virtco: The Ideal CARICOM Virtual Construction Corporation

Virtco is a CARICOM based virtual corporation which provides construction-related services to the region. The company is composed of business units located in different islands, each of which specializes in a different area of construction. Furthermore, each unit conducts business in the virtual office form described in 4.2.3. In other words, there are no mail rooms, no cafeteria or daycare facilities, few secretaries and very little inventory storage facilities.

Virtco targets design-build construction projects and provides comprehensive project support from the conceptual design phase to the end when the project is turned over to the client.

Having a virtual structure allows Virtco to compete effectively in the regional construction market alongside fully integrated regional construction firms at a lower cost with fewer entry barriers. As a result, its profit margins may be sizable even though the project delivery price remains below traditional market prices.

Virtco has made a substantial investment in various modern information technology systems that facilitate the seamless integration of the dispersed business units. All offices have full Internet access and use Lotus Notes® as a groupware platform. Such systems allow project teams to quickly form joint ventures and strategic alliances and exploit new construction across the region. After the project has been completed, these
teams may be temporarily dissolved, allowing the team members to pursue individual opportunities until another potential collaborative effort presents itself.

Virtco has also formed several strategic alliances with suppliers, equipment brokers, sub-contractors and clients located in each of the islands that it has an established presence in. These outside firms effectively become a part of the collaborative team. As a result, they must be carefully selected to ensure they meet certain requirements which benefit the whole team. For instance, all suppliers selected must provide high quality materials at competitive prices, must have favorable credit terms, must be reliable, and must add value to the total company offering by virtue of being connected on-line to the virtual corporation. Similar pre-qualification requirements apply to other extended team members such as specialty contractors. In addition, all except the smallest sub-contractors must have access to the Internet. Virtco also provides each team member with a copy of the Lotus Notes® client application software which may be downloaded on-line using the Internet’s file transfer protocol (FTP)\textsuperscript{11}. This will ensure that each project participant can effortlessly contribute to the project’s knowledge base.

The principal features of two major information technology systems used by the company are described in detail in the following sections.

\textsuperscript{11} FTP is the Internet communication standard which allows a local machine called a client to download files from a foreign machine called a server remotely
4.4.1 The Internet

The Internet supports E-mail delivery, transfer files via FTP, and access to remote terminals using the telnet protocol. This permits important applications to be downloaded remotely. In addition, the World Wide Web in conjunction with graphical user interfaces like Netscape® and Hot Java® called web browsers, allow information to be accessed worldwide in virtually any type of multimedia format.

In the case of Virtco, remote units are connected to local Internet access providers (IAPs) in each island via modem dial-up. Servers, which are located in each island, are the firm’s gateway to the Internet. Workstations are then connected locally to the servers. This is done using LAN networking if the server and workstation are in the same vicinity. Remote members of the units such as site personnel can be connected through a dial-up connection to the server, or through wireless communication using satellites. The various communication methods are shown in Figure 4-1).
Figure 4-1 Virtco Networking Diagram
In the diagram, the thick dashed circles represent three physically isolated server sites, or domains (typically on different islands). The centrally located domain is the network core from which information can be organized and relayed to other sites. It is connected to the other domains via the Internet. Locally however, client hardware can be connected to it through a server-based LAN or through modem dial-up. Also shown, is a computer communicating wirelessly through microwave relay by satellite.

4.4.2 Lotus Notes®

Lotus Notes® is an information manager for workgroups. It uses a client/server environment that allows users to communicate securely over a local area network or telecommunications link with a database of information residing on a shared computer or server. It combines an application development environment, a document database, and a sophisticated messaging system. It is highly customizable, making it easy to create custom-designed applications to automate standard workflows.

Like the Web, Notes can utilize all sorts of media such as Graphics, video, voice/sound, scanned images and so on. Furthermore, the new version of Notes® includes an add-on called Internotes which allows notes to convert databases directly into HyperText Markup Language (HTML).
One important feature of Lotus Notes® is the security it provides for workgroups. It protects data on multiple levels. Each level of security restricts information to an increasingly smaller group. Security could apply to users, or servers.

Another important feature of Notes® is its ability to replicate databases on multiple servers and ensure they remain in sync. This feature is called replication. This allows users on different networks, in different time zones, or countries to work with the same information simultaneously. The replication process is rather straightforward. Domain servers connect to each other at scheduled intervals through the Internet, and all changes made to the databases since the last replication are exchanged. Workstations loaded with client versions of Notes® can then access this information locally without necessitating expensive connectivity even though it might have originated hundreds of miles away.

Such an approach which relies heavily on the use of computers to support the development and communication of project information by the project participants, and which creates a shared project database in the process, is known as a computer integrated construction method, the benefits of which are described in the next section.

4.4.3 Computer Integrated Construction (CIC)

As demonstrated in the last chapter, the construction process is highly sequential. A project typically evolves from feasibility to design, construction planning, construction, and finally, to the facility management phase. In each phase, many professionals with
different specialties are called upon to work together. This requires large amounts of
information to be transferred among the various participants within each phase, and in-
between phases. Presently, the industry standard requires that this be done by drawings
and reports. Project participants filter out information pertinent to their operations and
then produce new drawings and reports. This process is prone to errors since data is
constantly being extracted, transferred, interpreted, and repackaged. Many of these
inefficiencies can be reduced using an IT intensive company structure like Virtco which
seamlessly integrates the design and construction phases.

CIC technology has been proposed in several forms by many experts and
organizations such as the Center for Integrated Facility Engineering (CIFE) at Stanford
University. Also, Teicholz et al. proposed the use of a shared object-oriented project
model as the basis for integration, (Journal of Construction Engineering and
Management, 1994). This object-oriented project model could be in the form of a 3D
design model. Although such a model has its merits, it could prove to be prohibitively
expensive to implement. The groupware method described above is more cost effective
and yields comparable results. According to Teicholz et al., use of computer integrated
construction technology provides several advantages over traditional building methods.
These are as follows:

Rapid Production of High Quality Design

Use of a shared project database can reduce the time required for design and
construction without sacrificing facility quality or increasing project cost. Using
conventional methods, quality is usually sacrificed under time pressure due to lack of time for proper coordination of participants and the creation of additional errors. For instance, in the traditional fast tracking method described in the last chapter, overlapping of the design and construction phases generally causes additional design and field changes resulting in cost overruns. The use of a shared database is this situation can facilitate better understanding of the design and hence the construction process, which leads to fewer changes required and higher quality.

**Promotes a Paperless Delivery Process**

Another advantage of using a fully computer integrated construction process is that it would reduce the reliance on paper-based information transfer, which is a prominent feature in conventional construction organizations as described in section 3.6.2. Although it is not yet possible to create completely paperless office by substituting transferring information electronically among workgroups, it is nevertheless a step in the right direction. Reducing the documentation required in the workflow process, allows professionals to concentrate on the actual construction.

**Effective Facility Management**

The shared database which is created and used during the construction process contains all aspects of the facility's make up. Therefore, it can be given to the owner after the project is completed to help manage, operate and maintain the facility throughout its
life cycle. This is comparable to the owner’s manual which comes with every new automobile.

The following section explains some of the competitive advantages a virtual construction company like Virtco which offers full service can expect to have over other more traditional forms.

4.4.4 Competitive Advantages of Virtco

Virtco derives competitive advantage by adopting a differentiated strategy. Because of its ability to form strategic alliances with participants outside its borders and also because it has the flexibility to quickly pull together the project team from various organizational units located across the region, it can pass along additional benefits to its clients, its suppliers and its subcontractors at various stages of the construction process. Furthermore, by targeting design-build contracts, all of Virtco’s forces could be mobilized simultaneously allowing them to contribute to the project from the onset. This would result in improved performance in terms of lower construction costs, time reductions as well as quality enhancement. Following is a description of the major advantages anticipated by using the Virtco construction process.
4.4.4.1 During the Design Phase:

Cost Savings

One result of allowing all participants to contribute to all phases of the project is that the contractors and suppliers can assist in the design of the facility, the architect can play a more active role in its construction, and so on. During design, while the architect is designing the facility, other participants could provide value-engineering services. For example, the supplier could give the architect suggestions of how certain materials perform in a particular CARICOM country when used for a particular situation based on past experience. The contractor could give the architects feedback on difficulties involved in constructing the facility and, possibly, some alternative designs which may be considered. On the other hand, by being a part of the design team, the supplier would have the opportunity to assess the material requirements before hand and could purchase materials at the most favorable wholesale prices. This helps the supplier to lower overhead costs and also allows the clients to get the benefit of materials below the market rate.

Allowing the contractor to communicate concerns about constructability during design leads to fewer claims for patent and latent ambiguities in the specifications during construction. Also, the contractor would be able to plan for the construction phase during the design period. They would be able to make good estimates of all aspects of the construction, making it unnecessary to inflate the bid price with contingency costs. They
could also shop around to get the best sub-contractor quotations which would lower the construction labor costs.

Finally, basing all designs, estimates and construction on one database would reduce duplication costs as well as errors due to inconsistent project information.

**Time Savings**

As mentioned, contractors would be given a longer period to do the estimating, since they would be present from the design phase. This would result in time reductions since the need for a separate bidding period could be eliminated.

Also, the presence of the contractor and the suppliers during the design phase making suggestions about design procedures could reduce the number of change orders needed later on due to unavailability of materials specified or difficulties in implementing the design.

In addition, since all participants would have access the same data source instantaneously, regardless of location, the time normally needed for information to percolate down through the conventional information channels would be significantly reduced. There would no longer be any time wasted in updating copies of the project documents for participants.

**Increased Quality**
Quality can be expected to increase during design since the suppliers, and sub-contractors would be able to provide value-engineering suggestions as explained above. Also, since the process would be less rushed and less adversarial, the contractor would be able to improve the quality of estimating done. This in turn leads to better contractor performance during the construction phase since the temptation to cut corners to lower costs would be minimized.

4.4.4.2 During the Construction Phase.

Cost and Time Savings

The designer could always be present to oversee the construction instead of leaving means and methods up to the contractor after the design is complete. as the AIA contract documents suggests should be the case. Hence, the contractor would be less likely to make expensive mistakes requiring expensive repairs.

The submittal process could be automated so that letters are automatically routed to the architect to reduce the delays in the process. If the architect is tardy in responding, dunning letters could also be sent automatically. As a result, the project participants will more fully be able to concentrate on the construction processes as opposed to incidental procedures.

The system could be designed so as to prompt suppliers when they need restocking. This saves time and cost since suppliers would be able to charge less if allowed to plan long in advance.

Increases in Quality
Since the designers would be able to participate to a greater extent in all aspects of the construction, it would be easier to ensure quality.

Also, since sub-contractors and suppliers are all pre-qualified by the company, it would be easier to ensure quality. This is because they would want to remain on Virtco’s short list, and also because they know in advance the standards Virtco expects from past experience.

Finally, since the company establishes long-term relationships with the client, they have to place a premium on ensuring quality in all work performed if future work is to be guaranteed.

The methods used by Virtco to organize its units is described in the following section, thus showing how the goal of targeting construction in the CARICOM on a regional basis may be implemented in practice.

4.4.5 The Organization of Virtco

Virtco consists of 4 major organizational units. These are described below.

1. Virtco’s headquarters is located in Antigua which is ideally located in the center of the CARICOM chain. It will serve as the center for administration and construction management, as well as containing an MIS department. Among other things, the administration department is in charge of the accounting and financial management. It will also maintain databases with important project information such as job costs etc.
based on information provided by other units. This allows other units to know how a particular project is going. Such knowledge could be used as a basis for self-examination or internal scrutiny.

The construction management duties in the Antiguan unit involves meeting with all construction managers located on remote job sites around the region, either directly through modem dial-up, or through replication with another remote server. Also, project schedules are maintained using applications such as Primavera®'s P3 system. It also maintains a database with sub-contractor information.

The MIS department is responsible for maintaining the computer systems for the entire company. One of its functions is to write Lotus Notes® macros to customize the product for its application in each island as well as to provide technical support.

2. The civil engineering department is located in Jamaica and is responsible for all the structural analysis and design work required by the company. It uses STAAD III Integrated Structural Design Software for Windows as the structural design package. It also uses AutoCAD 13 for windows for creating structural detailing drawings. It maintains a database of design methodologies used for each stage of each design. This ensures that all details drawn can be justified. It also acts as a knowledge base which junior structural engineers may use as a resource. Eventually, macros may be written which allow routine design work to be automated. For instance, design of a two-way RC slab might simply require length, breadth and loading inputs, from which a complete design and reinforcement schedule could be produced. In addition to the
standard hardware requirements, the company also has a colored plotter and scanner, capable of handling construction drawing-sized sheets.

3. The architectural unit is located in Barbados. It does the conceptual and detailed architectural design. The unit uses AutoCAD® 13 for Windows extensively for drawings, along with 3D Studio® for rendering. The unit also has similar hardware to the engineering unit. It maintains a database of all drawings presently being done. Any updates are also placed in the database and filed by date modified.

4. The estimating and procurement unit is located in St. Lucia. It performs estimates for all of Virtco’s projects. Also, it maintains a materials price database for selected suppliers in each island that Virtco does business. They provide suppliers with depositor access. the database tracks material prices with significant variability and alerts the estimator who may then inquire of the suppliers the reason for the variance. Procurement department use information provided by the estimating, engineering, and architectural units.

In the next section, the market segment such a corporation should target to maximize its effectiveness is identified and discussed.

4.5 Market Segmentation: Targeting Tourism

Of the possible market segments a virtual construction company could target, the tourism sector would be the most suitable. To support this assertion, a brief overview of the tourism industry’s most important characteristics follows.
According to the Caribbean Handbook 1994/95, the CARICOM region is more dependent on tourism than any other part of the world. In 1993, the region received approximately 22 million visitors and this figure has continued to grow. Also, since 1993, the appeal of the region has been increasing and hotels have habitually been enjoying higher occupancy rates. What is more, starting in 1993, a Caribbean Coalition for Tourism was formed to start an advertising program in North America. This was an unprecedented move by CARICOM states which up to this point had tended to regard other the islands as competitors and which had therefore traditionally pursued tourism markets independently. The move was an immediate success and a 10% increase in the total US visitors to the region was registered in that year. Finally, the first ever CARICOM tourism summit was held in Jamaica in 1992 and this also proved to be a success. Following this was the Caribbean Heads of Government summit in 1995 which focused on tourism, which will be used as a vehicle for launching the newly established Association of Caribbean States whose membership embraces all countries located in or around the Caribbean Sea.

Besides being the most vibrant industry in the CARICOM region, tourism is also a suitable target for Virtco since it is heavily reliant on construction activity. The constructed works needed to support tourism are the largest contributors to total construction in several of the islands. In Antigua, for example, construction services are in constant demand for building hotels, upgrading ports of entry such as cruise ship docking facilities and airports, constructing tourist shopping complexes, and so on.
Even more important from a virtual company’s point of view, is the fact that there exists opportunities for synergistic relationships between the two industries. For example, a virtual construction firm could form a strategic alliance with hotel chain developers or tourist related franchises which seek to expand operations throughout the Caribbean. The world famous Sandals Resort is one example of a hotel chain which might be a likely candidate for such an alliance.

Sandals Resort is an internationally renowned all-inclusive hotel chain for couples only which is wholly owned by a self-made Jamaican businessman, Gordon "Butch" Stewart. He began in 1981 by purchasing and remodeling an old hotel and renaming it the Sandals Inn. Over the next decade he repeated this process several times, until the number of hotels in the chain across Jamaica totaled six. In the 90s, Butch Stewart extended the chain Caribbean-wide by establishing two more in St. Lucia and one each in Antigua and Barbados. He also intends to open a location in St. Kitts. The hotel operations are fairly integrated and in Jamaica, it is possible to stay in one hotel and yet enjoy the features of all six, since guests are transported between the various sites. Also, there are often exchange trips between visitors to Sandals in Antigua and St. Lucia.

All-inclusive hotels have been hailed as the one possible economic savior of the region's tourist industry. They generate a far higher level of employment per hotel room and they typically experience a much higher occupancy rate. Their immense appeal to
visitors is the fact that all services and facilities are included in the price of the hotel. This effectively eliminates most of the financial risk involved in planning a vacation since all costs are known in advance. Butch Stewart has taken this idea one step further by purchasing the national airlines of Jamaica, Air Jamaica. As a result, he is able to provide them with a fixed price for the entire cost of the vacation by structuring a holiday package which includes airfare.

Although this is the most famous example, several other successful hotel chains have been established across the region both all-inclusive and non-inclusive such as Club Med, Couples and the Hilton Hotel.

Unlike hotel chains, few examples of tourism related franchises with locations across the region exist. In this case, therefore, it is possible that a virtual construction corporation could create a market where none presently exists. Since the virtual firm would be well positioned to provide construction services for franchises such as travel agencies, car rental agencies, department stores etc. it could focus on this market segment as the developer as well as the construction manager. Buy providing franchise infrastructure cheaper than would be otherwise possible, the corporation could become the catalytic force in providing a new way of doing business in the tourist industry.
The next section provides a hypothetical situation existing between Virtco and a fictitious all-inclusive hotel chain called Loafer’s International, to illustrate how a strategic alliance could be formed between the two industries.

4.5.1 Virtco in Operation: A Hypothetical Condominium Development Project

The development company, Smith Development Co. (SDC) which has developed the world famous Loafer’s International all-inclusive hotel chain in Jamaica has decided to expand into some of the other CARICOM territories starting with a condominium development project in Antigua. SDC has used Virtco’s construction services for the last hotel constructed in Jamaica and was very impressed with the service received. Hence, SDC is happy to discover that Virtco also operates out of Antigua. They approach Trevor Thomas who along with Wayne Martin heads the Antigua office. On the last project, although SDC required input from Virtco during the design phase, they had contracted with a separate Jamaican architect to perform the major part of the design work. This time however, Thomas has convinced the SDC representative that it is in their best interest to allow Virtco to manage the entire project, from design to close-out, since Virtco has the advantage of knowing the standard of design SDC was accustomed as well as having familiarity with architectural design in Antigua.

As soon as an agreement is reached, Thomas visits the site and takes some pictures along with filming a short video. Thomas e-mails Jay Mason, the head architect in the Barbados about the details of the newly acquired project using Lotus Notes®. Embedded in the e-mail message are some scanned photos of the site, a site plan and a
link to a file containing the Video clip deposited in the central database. Thomas also sends a carbon copy to Wayne Fong, the person in charge of the Jamaican civil engineering unit which had worked with SDC on the previous project, along with the chief estimator in St. Lucia to keep them informed so that they will be in readiness when their services are required.

Mason immediately downloads compressed images of the working drawings of the last SDC project located in the past project archives as a starting point for the design work, while the estimating and procurement unit gives suggestions about what is the best type of materials to use based on a database of material suppliers located in Antigua. The project is well on its way.

The final chapter presents a business plan for a company which resembles the one just described.
5. The Virtco Business Plan

5.1 Introduction

This chapter of the thesis presents a business plan for implementing and operating Virtco. It is designed to be used as a plan for attracting investment in the company and also as a model for deciding future company policy. It is subdivided into nine (9) sections. these are:

1. Executive Summary
2. An Overview Of the Company and the Concept
3. Industry Research and Analysis
4. Marketing Plan
5. Design and Development Plan
6. The Financial Plan
7. Critical Risks, Assumptions and Contingency Plans
8. Management Team
9. Appendix

The plan relies on information presented in the preceding chapters and as a result some of the subject matter discussed previously is repeated for the sake of completeness of the plan.
5.2 Executive Summary

Although the construction sector in the CARICOM region as a whole has performed fairly well, construction demand is unevenly distributed in the individual islands and is also difficult to predict. This has hampered growth opportunities of construction firms in the islands and has discouraged the formation of large construction corporations based in different islands which target regional projects. Using a virtual corporation structure however, Virtco intends to undertake regional construction projects without being exposed to the usual risks associated with this traditional approach.

Virtco was conceived in October 1995 as part of a Civil Engineering Master of Science thesis. It aims to begin operations in January 1997 as a joint partnership or two civil engineering professionals, first in Antigua and then gradually expand to include three more CARICOM countries by 1999. Virtco will be a virtual company which provides a wide range of construction services for clients in the region. Its main competitive advantage is that it will be able to provide high quality construction services to its clients due to strategic alliances formed with suppliers, subcontractors and with the clients themselves. In addition, by applying technology to the method of information exchange, it will provide further benefits due to increased efficiency in workflow processes. Virtco’s long term goal is to become the number one firm specializing in the design and construction of tourism facilities in the Caribbean.
5.3 An Overview Of the Company and the Concept

5.3.1 Virtco: The Company

Virtco will be a virtual company engaged in construction activity for tourism facilities in the CARICOM. It will possess typical organizational units as other companies in the construction industry, except each unit will be based in a different CARICOM member country. The units will be seamlessly integrated with each other through the use of sophisticated IT systems. As a result, the fact that units are physically removed from each other will be transparent to the clients and even to the workgroups themselves.

The company plans to commence operations in January, 1997. It will require an initial investment of $30,000 to get it up and running and to ensure that it will possess sufficient working capital for future operations. Virtco will be wholly equity financed.

The principal independent branches of Virtco Construction Corporation will include; Virtco Construction Management Services, Virtco Engineering Services, Virtco Quantity Surveying Services, and Virtco Architectural Services. Virtco plans to solicit primarily design-build contracts. However, due to the inherent flexibility of the virtual corporation structure, it will be able to carry out different aspects of the construction process independently if required.
Each of the major units will be located on a different CARICOM island. By organizing the firm in this way, Virtco will be able to obtain construction projects in different islands by marketing the offerings of the entire corporation at each location.

5.3.2 Virtco: The Concept

The concept of Virtco was suggested by Trevor Thomas in a thesis, required for the Massachusetts Institute of Technology Master of Science Degree Program. The purpose of this business venture is to revolutionize the CARICOM construction industry by using information technology to create a profitable virtual construction company along with facilitating increased regional integration and cooperation.

Through the use of a groupware application called Lotus Notes®, and the Internet as the main long-distance channel, Virtco’s business units will be able to collaborate on construction projects from remote locations around the CARICOM region. The Lotus Notes® application will allow project participants to use and contribute to a shared, online project database. Among other things, this shared database will ensure synchronization in all pertinent project data, it will reduce the need for duplication of project information, and it will maximize the speed and accuracy of information transfer between project team members through automation of routine workflow processes.

Use of the Internet as a wide area network (WAN) connecting Virtco’s remote business units makes the real-time communication requirements of a virtual corporation affordable to a start up company such as this, while being robust enough to allow it to
compete with any large construction corporation with well connected branch offices. Furthermore, the ubiquity of the Internet makes it possible to form units anywhere without significantly impacting the communication costs. Units will typically be comprised of professionals working from remote offices. They will share ideas across telephone lines using modem dial-up from the comfort of their own home or anywhere else with a phone jack and a table that can support a laptop. This will result in reductions in operating and overhead costs and stimulate team member efficiency. Virtco also intends to maintain close contact with resources available at the Massachusetts Institute of Technology by appointing an advisory council made up of faculty members and alumni. This will allow it to have access to the innovative strategies which could be considered during periods of growth for instance. Connection with these MIT based personnel will be made possible through Internet connection.

There are several benefits to procuring services from a company organized in this manner that permeate throughout the value chain, from the client to the supplier. These will be emphasized when marketing Virtco’s services to clients. More is said about this in the marketing plan.

5.3.3 Entry and Growth Strategy

Initially, Virtco will attempt to establish strategic alliances with owners of hotel chains and other tourism service providers throughout the region. At the beginning, the only full time members will be two civil engineers located in Antigua who, in addition to offering civil engineering consultancy services, will pursue construction management
opportunities in tourism-related projects on the island. They will be working from home offices, hence it will not be necessary to secure office space etc. as is the case with traditional engineering/construction firms. This means that there is no real pressure to start operations at any set time. To minimize working capital requirements therefore, the Virtco Corporation will officially commence operations when the first job is secured. For the purpose of the financial modeling, it is assumed that this will occur in January 1997.

By its second year of operation, Virtco intends to start operations in Jamaica. It is intended to move the civil engineering headquarters there at this time although construction management will still be controlled in Antigua. More units will be added in the following years, depending on the initial success of the first two.

In the beginning, strategic partnerships will be formed with professionals related to the construction industry in other islands as needed. These persons will most likely work with Virtco on a part-time basis, but still hold full jobs with other firms, until a reasonable sized project backlog exists to justify working full-time. These professionals will then be full fledged managers in the company and will form the nucleus for the organizational units. The main persons being considered for these functions are described in section 5.9. Following is a brief description of the principal organizational groups which will be a part of Virtco when it is established throughout the region.

1. The administrative center will be located in Antigua. It will include an accounting unit, a marketing unit along with an MIS and a technical support unit. This center will
be used to start Virtco’s operations and as a launching pad for setting up other units and facilitating collaboration between them.

2. Virtco Engineering Services will be a civil engineering unit located in Jamaica. It will be composed of engineering consultants with different specializations whose services may be retained as needed. For instance, one consultant might be specialized in structural engineering, another in environmental engineering and so on.

3. Virtco Architectural Services will be the architectural unit and will be located in Barbados. It will consist of a senior architect along with one or two junior architects and/or draftspersons. These personnel will be highly competent in the use of CAD since this will be the major method by which project drawings will be shared with the other units. All conceptual and detailed design will be conducted in this department in collaboration with the engineering department.

4. The estimating and procurement unit is located in St. Lucia. It will be responsible for quantity surveying as well as communicating with suppliers in the various islands to obtain pricing information. Also, it will be the department responsible for maintaining and updating pricing, material and equipment information in the shared database for other groups to access.

5. The construction management unit will be widely dispersed in various islands. It will simply consist of professional project managers around the region who will be put in charge of any Virtco projects located on their island. However, the administrative center which is located in Antigua will function as the construction management
headquarters which the dispersed project managers report to and obtain information from.

The company aims to grow rapidly within the first five years at which time it will diversify its portfolio to include tourism markets in other Caribbean islands outside the CARICOM region depending on the current economic situation which might exist.

5.4 Industry Research and Analysis

5.4.1 The Tourism Market

According to the Caribbean Handbook (1994/95) the Caribbean has the world’s fastest growing tourist industry, accounting for 28% of its GDP. All told, if all of the Caribbean islands are into consideration, more than 13 million holidaymakers (extended stop over visitors), and almost 9 million cruise ship passengers visit the region yearly giving a total of 22 million tourists, who spend in excess of US$9 billion on goods and services. To accommodate them, there are already 2,600 hotels with a total of 120,000 rooms and expansion is underway on most islands. Of the 13 million visitors who visit the islands for extended periods, the CARICOM accounts for approximately 2,700,000 or 21 percent. Jamaica has by far the largest tourist industry, (approx. 48%), followed by Barbados, Antigua, St. Lucia and Trinidad and Tobago as shown in Error! Reference source not found.. It is this lucrative sub-sector that Virtco intends to focus its energies initially. Depending on market conditions, after it becomes established, it might expand its operations into none CARICOM Caribbean countries.
Tourism related construction is expected to grow faster in Jamaica due, among other things, to government initiatives such as the Hotel Incentives Act, and the Resort Cottages Incentives. Under the Hotel Incentives Act, tax holidays are available for approved hotels ranging from 10 to 15 years depending on the location and/or size. Furthermore, the owner is allowed duty-free importation of materials and equipment for construction, whether building a new hotel or extending an old one. Similarly, a recognized resort cottage owner is entitled to tax-free gains and profits for a period of up to seven years. If a person owns two or more cottages, with a minimum of ten rooms, he or she is also allowed duty-free importation of construction materials and equipment.
At the other end of the spectrum, although it is the smallest tourism industry of the major countries considered, the tourism in Trinidad and Tobago also makes a sizable contribution to the total number of visitors in the region. What is more, the government is vigorously trying to promote this industry, hence there the potential for future tourism development is probably greater there than for any other island. Virtco will position itself so as to ensure it can rapidly converge on any opportunities which might occur there in the future.

From current trends, in a year, for each hotel room located in the region, there is an average of 100 tourists. Hence a rough estimate of the total number of rooms in is 27,000. Furthermore, according to The Caribbean Yearbook, the number of hotel rooms in most islands can be expected to double by the year 2000. At a conservative estimate of US$8000 per room, this represents a total of approximately US$216,000,000 worth of construction over the next five years. According to the Caribbean Handbook, the growth rate of tourism in the Caribbean ranges between 4 and 8 percent per annum. For the purpose of forecasting demand, it is assumed that for the next ten years, this figure will be taken as 6 percent, and that the growth rate of the corresponding tourism construction demand is 3 percent. This implies, for the next five years, construction demand per year = \( x(1.03)^{(n-1)} \) where \( x \) is the value of construction in 1997, and \( n \) is the number of years taking 1997 as unity. Taking the total value of construction from 1997 to 2001 as US$216,000,000 gives a value for \( x = \) US$40,684,587.
Virtco intends to cash in on this lucrative sector of the construction industry, by specializing in the construction of tourism related facilities.

These projections are used in subsequent projections.

5.4.2 Estimated Market Share

The table below shows some projections for Virtco's establishment in the tourism facility construction market. They tend to be on the conservative side to minimize the risk of falling short of the projections.

It is assumed that in its first year of operation, Virtco will only secure one or two medium-sized contracts worth a total of US$200,000 or around 0.0005 of the total market. This figure is expected to approximately double for the next three years as Virtco begins to establish creditability and strategic alliances with clients. However, by the year 2000, this growth is expected to start leveling off as Virtco approaches its maturity phase. To remain conservative, it is assumed that the growth rate of the total market decreases from 3 percent per annum to 2 percent starting in 2002. Eventually, it is projected that Virtco's market share will settle at just over 4 percent.
<table>
<thead>
<tr>
<th>Year</th>
<th>Virtco's Business (US$)</th>
<th>Total Market (US$)</th>
<th>Market Share (%)</th>
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</thead>
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<tr>
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<td>200,000</td>
<td>40,684,587</td>
<td>0.49%</td>
</tr>
<tr>
<td>1998</td>
<td>400,000</td>
<td>41,905,125</td>
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<td>4.32%</td>
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</tbody>
</table>

Table 5.1 Tourism Facility Construction Projections

### 5.5 Marketing Plan

#### 5.5.1 Overall Marketing Strategy

Marketing will be critical to the success of Virtco in the CARICOM area. Potential clients must be made aware of the added benefits Virtco’s virtual corporation structure provides over traditional companies if they are going to request its services. It is expected that there will initially be some reluctance by developers to approach construction delivery in this way due to the novelty of the method, however, as projects are completed successfully, on time and on budget, much of the initial concern can be expected to subside. Hence, ensuring that the first few projects are well executed will be a major marketing tool for the company. Following are some of Virtco’s benefits which will be used to market its services to potential clients.
Efforts will be focused on making the clients aware of the benefits of one-stop shopping for construction services. Virtco makes this possible by bringing the whole range of expertise available in each island to bear on a particular project. The client is then afforded the savings in cost and time as well as the improvements in quality which can result from a truly collaborative team effort. The project team would not be based on individual companies coming together in an ad hoc fashion for a particular project, but rather, on teams which have a long history of working together. An explanation of some of the more obvious benefits follows.

**One Stop Shopping**

One of the major advantages of getting all services from one contractor providing a full range of construction services is that it allows hassle-free, one-stop shopping. Clients would be able to enter into a single contract with one firm for construction delivery. Much of the needless time and expense of entering into separate contracts for design and construction would be eliminated, e.g. the need for a separate bidding phase.

Also, the design, construction and estimating teams would all be able to work together from the conceptual design phase through to the construction phase. The benefits derived from this type of collaborative effort would be fewer architect-initiated change orders, greater opportunity for value engineering contributions from all parties, greater appreciation for each other's role and how the actions of one party affect other team members and so on.
Reciprocal Benefits to Clients and Suppliers

Virtco's close relationship with key suppliers allows them to come into the picture from early in the construction process, Hence orders could be placed earlier to prevent delays and to get more competitive prices. Also, due to batch ordering, suppliers would be able to better manage their inventory. This would result in material prices that are below market rate and this saving can be passed on to the client. Suppliers would also be able to contribute during the design phase to further save the client money. This results in a win-win relationship between the client and Virtco, as well as between the supplier and Virtco. Strategic alliances with various specialty subs would result in similar benefits.

Strategic Alliances with Clients

Moreover, since Virtco also intends to form strategic alliances with clients, another win-win relationship would develop. There will be mutual understanding between the two parties in terms of design preferences etc. because of past relations. Also, it would be possible to standardize designs to some extent so as to further reduce future design costs. This would lead to more rapid design and construction with fewer change orders. Innovative payment schemes could be created such as automated billing and payments, sharing of cost savings from value engineering and so on. Also, the client would have the assurance that Virtco will endeavor to do a good job since future projects will be contingent upon this.
Offerings to Other Construction Organizations

As Virtco grows, it intends to offer additional construction services and to make some of these services available to other firms. For instance, it could provide them with up-to-date material price lists, quantity surveying services, industry statistics or even project management assistance, which will enable smaller companies to target larger projects than would otherwise be possible. These services could be made available via simple modem dial-up to a local Virtco server and users would have to pay for access privileges.

5.5.2 Pricing

Virtco is considering a variety of pricing options for its services. The primary arrangement under consideration is to charge clients based on the services they so as to ensure that the units involved make a profit from their efforts. Along with this, an additional percentage, which would go towards the administrative headquarters located in Antigua for its facilitating role. The percentage going towards the administrative center will be used to operate and maintain systems throughout corporation.

The operational implications of this pricing system will be monitored and its structure will be refined as needed based on customer satisfaction and effectiveness.
5.5.3 Service and Warranty Policies

Virtco will provide similar services and guarantees offered by regular construction firms, such as insurance against contractor's liability, indemnification of the client and the furnishing of bonds guaranteeing the faithful performance of the contract. In cases when the contract involves both design and construction, guarantees normally provided by consultants under standard form contracts, such as the AIA documents, will also be included.

In addition, the company shall comply with all statutes and regulations and other legal requirements for construction procurement in the respective islands.

5.6 Design and Development Plan

5.6.1 Initial Startup and Operating Plan

Virtco will require an initial investment of $30,000. This will be supplied by its two partners, Trevor Thomas and Wayne Martin. Trevor Thomas will finance $20,000 while Wayne Martin will finance the remaining $10,000. As a result, Thomas will own two-thirds of Virtco while Martin will own one-third. After the initial construction management job is secured in Antigua, computers, printers and networking hardware will be purchased, as well as Lotus Notes® and Internet connectivity. As a result, the founders will be able to work from home offices. The work will be subcontracted out to local subcontracting firms and materials will be ordered locally. For the first five years, all earnings at the end of the year will be retained in order to finance expansion. However, in
the first two, the partners will periodically be paid an allowance as surplus cash becomes available. Eventually, the partners along with other new employees will be paid a monthly salary.

5.6.2 Hardware Requirements

Virtco intends to make its reliance on state-of-the-art communications technology a source of competitive advantage over other firms in the industry. Hence, from the outset, it intends to employ the latest in computing applications available. This will entail the use of high-speed, high capacity servers in each of the principal islands of operation. In the case of units consisting of one or two persons operating from a home office, the server will also function as a workstation.

In addition, each office will have specific hardware requirements depending on its main activity. The major requirements are as follows:

1. Each office will have a computer which is equivalent to or better than a 486DX IBM compatible PC. In the case of the architectural and engineering units, the equivalent of Pentiums or better will be needed which are capable of supporting powerful analysis and rendering packages.

2. All systems must include hardware required for accessing the Internet, e.g. ethernet cards and telephone fax-modems.
3. Each office will have at least a printer and a scanner. Where possible, faxing software which along with faxing capabilities allow users additional features such as electronic archiving of faxed documents, will take the place of standard fax machines.

4. The engineering and architectural units will also possess large scanners for converting manually drafted drawings to electronic form. This will be used to convert hand-drawn figures to electronic form so that they may be deposited in the project database and made available to other units.

5. Each office will also possess a large plotter capable of plotting full sized construction drawings.

6. Construction managers on each island will have at least one pen-based or laptop computer capable of dialing into the local server from the worksite.

7. The units may eventually consider videoconferencing equipment and/or virtual whiteboards for conducting remote conferences with the other team members and clients in the future.

8. Finally, items such as routers, bridges etc. will be required in units with more than one workstation per server.

5.6.3 Development of the Communication System

As mentioned above, Virtco relies on the Internet as the primary communications networks for linking the Lotus Notes® servers. In each island, workstations will be able to use modem dial-up, which only requires a local call to be made, in order to access a shared project database. Also, access to the Internet makes information which is pertinent to Virtco readily available. For instance, information on the latest technological
innovations, can be easily accessed through on-line magazines and forums and through connectivity with MIT faculty members and alumni. In addition, on-line technical assistance will be available for many of the hardware and software products used by Virtco and Web sites which contain answers to Frequently Asked Questions (FAQs) on these topics can be reviewed as needed.

A significant part of Virtco’s investment in software is for Lotus Notes®. Along with the cost of the application itself, there is the cost associated with training workgroup members to use it effectively. Also, much customization of the program’s basic structure will be needed if it is to fulfill all of Virtco’s requirements. This will require considerable programming of macros and design of forms, templates, databases etc. Fortunately, Lotus Corporation provides initial technical training for companies which have newly purchased the software.

5.7 The Financial Plan

Detailed financial forecasts for the first five years of operation have been prepared using cost estimates, which take into account future growth projections and income stream forecasts (Table 5-1). All projections are in 1995 US dollars. Virtco’s fiscal year runs from January 1 to December 31. In the appendix are a) monthly cashflow projections for the first five years of operation, b) income statements again for the first five years, and c) the balance sheet forecasts for the first three years.
5.7.1 Cash Flow Projections (Appendix table A-1)

Because Virtco intends to synchronize its first project with startup, and also due to its low initial overhead costs, Virtco expects favorable cashflow projections within the first year of operations. This includes achieving a positive cash balance as well as a slightly positive cumulative cash flow. It is reasonable to expect the first project to be worth at least $200,000 as estimated in Table 5-1. The costs are derived by estimating the major capital investments required to get the company started, assuming a two-man start-up team and a 100% sub-contracting level. The large cash requirements in January 1998 (US$15,836) is due to the cost of equipping the Jamaican unit. Approximately every 6 months, either another unit will be started, or an old one will be upgraded. This will be funded from the surplus revenue streams of other projects.

In the pro forma monthly cashflow statements, hardware expenses include initial purchase price and expected future operating and maintenance costs. Miscellaneous networking equipment include such things as bridges, ethernet cards, fax/modem cards, cables, and so on.

General software include such things as administration programs such as Microsoft Office and Delrina Winfax Pro. The cost of Lotus Notes® is directly proportional to the number of computers and/or servers since a licensing fee of US$450 is paid for each additional computer on which it is installed. The cost of Internet access is based on the present cost in Antigua which is US$30 per computer per month for the first
twenty hours. The US$500 per month for phones represents mainly local calls which predominate for the initial period of operations, and before Virtco establishes links outside Antigua. The high cost projected is due mainly to the frequency of modem connections between the two sites, for fax transmission and Lotus Notes® database access. Starting inventory includes such things as diskettes, printer paper and toner.

The initial investment of US$30,000 shown in the cashflow projection as carry over cash in month zero represents the seed capital provided by the partners. This is to ensure that the desired minimum cash balance of at least US$5,000 is maintained.

5.7.2 Income Statements (Appendix Table A-2)

Net earnings are expected to be slightly positive at the end of the first fiscal year. However, a large increase is expected at the end of the second year ($30,573). Due to rapid expansion in the third year, net earnings are expected to drop, but will increase the following year and stabilize from there on.

5.7.3 Balance Sheets (Appendix Table A-3)

Virtco is designed to be lean and this is reflected in the balance sheet. The company has excellent liquidity. It is expected that current assets will be over 80% for the first three years. Most of the fixed assets are in the forms of computer equipment.

The balance sheet is based on the following assumptions:

1. 30 day terms on receivables and payables
2. No debt financing

3. Inventories will be fully consumed during the fiscal year.

5.8 Critical Risks, Assumptions and Contingency Plans

One of the major assumptions is that the Internet will be affordable and as prevalent in the Caribbean region as this venture requires. However, there are certain factors which must be taken into consideration when making such an assumption. For one thing, the future of the Internet even in the US is somewhat uncertain. In April 1995, the National Science Foundation (NSF)-previously one of the major Internet Backbones-which had been subsidizing the Internet through the provision of US$30 million per year, cut off funding. As a direct result of this, the cost of the Internet in the future, which will be supported mainly by commercial and university networks, could skyrocket.

There are also other problems associated with over-reliance on the Internet in the Caribbean. Presently, Cable and Wireless has a controlling interest in the Caribbean’s external communications. As a result, they have a monopoly on access to the Internet. So far, there has been complaints in some of the islands that they are not expanding services as quickly as they might for fear of diminishing the demand for long-distance service which has been lucrative for the company. Also, they have made it impossible for other entrepreneurial ventures to supply full Internet access, without paying huge royalties. If this situation persists, use of the Internet as Virtco’s main communications network will again be prohibitively expensive and unreliable.
A way to combat these problems if they occur is to use modems in place of the Internet to connect to various domain servers. It is expected that although this will impact on the profit margins to some extent, the company will be able to remain profitable. Furthermore, special arrangements could be made with the British telecommunications company, Cable and Wireless, such as the purchase of dedicated lines or leasing of lines to further decrease the communication costs.

Another cause for concern is that in some of the islands, notably Antigua, electrical power tends to be unreliable at times. Blackouts occur regularly and this can severely affect inter-island communications e.g. if power is down when replication (the transfer of information from one Notes® database to another) is expected to take place. This problem can easily be rectified by simply using quick response standby generators.

The exchange rate fluctuation is also a cause for concern when doing business in some of the CARICOM countries, especially in Jamaica and Guyana. This might be controlled by ensuring most of the financial transactions are done in a country with stable exchange rates, as is the case in Antigua whose currency is tied to the US dollar.

Finally, many of the projections in this business plan are based on the assumption that Virtco will be able to locate and form strategic relationships with clients fitting the desired specification. To deal with this risk, the company could develop contingency
plans which would enable the company to modify its organizational structure to pursue other types of clients, such as those requiring separate design, quantity surveying and contracting.

5.9 Management Team

In its initial stages, the company will consist of four partners who possess complementary specialties and which would therefore supply the various areas of specialization required. The emphasis of Virtco in terms of partner-selection is to attract young, creative and competent entrepreneurs. A brief profile of these four members follows.

Trevor Thomas

Trevor Thomas is the principal partner in Virtco, with two-thirds ownership in the venture. He is a graduate of the University of the West Indies in Trinidad, from which he obtained a Bachelor of Science (B.Sc.) in 1993. There, he majored in civil engineering, specializing in structural engineering. He is currently completing a Master of Science degree in civil engineering in the Center for Construction Research and Education at the Massachusetts Institute Technology (MIT). Through academic training and practical experience, he is versed at project management techniques, and also possess general business administration skills. In terms of relevant computer related experience, he is, among other things, versed at macro programming for Lotus Notes® and he is a competent programmer in HyperText Markup Language, (HTML).
Trevor will head the administrative unit in Antigua, which will be the hub of the information flows of Virtco. He will be responsible for most of Virtco’s marketing effort along with overseeing the efficient operation of the network. He will have the final say on questions related to company policy.

Wayne Martin

Wayne Martin is the minor partner in the company with one-third ownership. He will also be located in Antigua, and will assist in the management of the administrative unit. He is also a graduate of the University of the West Indies in Trinidad, from which he obtained a Bachelor of Science (B.Sc.) in 1991. Since then he has been working in the engineering field, first for the government and then for Geotech, a private geotechnical and transportation company based in two CARICOM islands. He is experienced in a wide range of engineering related activities, such as structural and architectural design, quantity surveying, structural appraising, etc.

Wayne Fong

Wayne Fong is another graduate of the University of the West Indies. He also majored in civil engineering, however, prior to this, his main area of specialization was architecture, again obtained from the CAST Institute. Furthermore, he has nearly ten years experience in a structural design and construction management firm by the name of Urban Development Corporation (UDC) in Jamaica of which he is a resident. He will head Virtco Engineering Services, the civil engineering unit which will be located there.
Jay Mason

Jay Mason is an architect by training. He was trained in the College of Arts Science and Technology (CAST) in Jamaica. He is a citizen of Barbados which is where he will be stationed. He has worked extensively with several renowned architectural firms in the island, and is also interested in entrepreneurial activity.

He will head the Virtco Architectural Services, the architectural unit located in Barbados and will initially be solely responsible for most of the design work required. However, as the volume of projects increase, the unit could expand to include other competent architects around the island.

A person who will head Virtco’s Estimating and Procurement Services in St. Lucia in has not yet been identified, and neither have the suppliers nor the sub-contractors with whom the company will form alliances. These will be determined later on as the company grows.

The Advisory Committee

Finally, Virtco will have an advisory committee which will be co-chaired by Mr. Charles Hellwell, a senior lecturer at MIT in the Center For Construction Research and Education (CCRE) and by Fenioski Pena-Mora, a Professor in the Intelligent Engineering Systems Laboratory (IESL). Other faculty members in MIT’s Construction Management
and Information Technology Departments as well as other MIT alumni would make up the rest of the committee. This committee would serve as an information resource to inform Virtco of the latest technologies which it could consider implementing, as well as to provide networking opportunities.
6. Conclusion

This thesis presented the idea of applying the virtual corporation model to the construction industry in the CARICOM region to enable collaborative teams to target project opportunities in any of the member countries. After presenting a brief overview of the CARICOM, the situation which exists in the regional construction sector was described. Next, the features of a generic virtual corporation were discussed as well as the specific requirements if the model is applied to construction industry. Lastly, a business plan was presented for a virtual construction company in the CARICOM.

That such an undertaking is possible is unquestionable, however, for it to be truly successful, many of the assumptions made would require some degree of re-evaluation and refinement. For one thing, one of the only successful long-term collaborative efforts ever implemented is the West Indies Cricket team, and even this has begun to show signs of collapse after dominating the cricketing world for decades. This would suggest that, although these countries appear to have so much in common and should be able to derive considerable benefit from cooperative activity, there is something inherently difficult in Caribbean integration which is not immediately evident to the casual observer. Concerns such as cultural, political and economic incompatibility would certainly need addressing before plunging into this venture.

Also, although the traditional construction delivery methods used in the CARICOM are lacking in many aspects, it represents an institution which has existed for
generations which is not soon going to change, whether or not information technology can greatly increase efficiencies. As a result, it would be necessary for a virtual construction corporation like Virtco to co-exist with traditional firms. This means that considerable marketing efforts would be required to convince potential clients of the advantages of employing a virtual corporation to do something which conventional organizations have been doing for eons albeit inefficiently.

Another area of concern is the question of how such an organization would be managed financially. Most disputes in the CARICOM construction industry are related to monetary issues. It is commonplace to hear of sub-contractors and suppliers squabbling with contractors and owners over late payment, underpayment or sometimes even non-payment of fees. In the case of a virtual corporation dealing with units located all over the region and with many sub-contractors and suppliers, the possibility exists that this problem could be augmented. As this is a sensitive issue, it requires much greater attention than is given in this study. Added to this is the possible legal consequences of transferring currencies between islands for projects done, some of which are not convertible in other islands.

Also, the heavy reliance on information technologies such as the Internet and groupware which a virtual construction corporation proposed would require are based on the assumptions that these systems will be as affordable and as easily accessible in the CARICOM region as they are in the US today. This might prove to be an unrealistic
assumption in the future after the present disorder in the IT marketplace regarding ownership of such technologies sort themselves out.

Finally, the plan to establish a company called Virtco to operate as a virtual corporation which targets tourism-related, design-build opportunities in the CARICOM area, assumes that this market will continue to grow and that through suitable marketing efforts, the company will be able to secure lucrative strategic alliances with developers of hotel chains and other tourism facilities. This assumption is based purely on myopic economic analysis techniques of the existing industry rather than a rational approach which would be more accurate if the required information was available.

Nevertheless, the theory of a virtual corporation is sound and warrants consideration for the future when the predictions of a truly global village becomes a reality.
Appendix
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Table A-1 (a) Monthly Projected Cash Flows (1997)
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*(Cash Requirements)*

|  | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| | (41,091) | (15,064) | (8,949) | (7,735) | 69 | 22,149 | (3,574) | 3,638 | (3,621) | (6,889) | (5,489) | 77,951 |

+ Carry Over

|  | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| | 81,155 | 40,064 | 25,000 | 16,051 | 8,316 | 8,385 | 30,534 | 26,960 | 30,598 | 26,977 | 20,088 | 14,599 |

Ending Cash

|  | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| | 40,064 | 25,000 | 16,051 | 8,316 | 8,385 | 30,534 | 26,960 | 30,598 | 26,977 | 20,088 | 14,599 | 92,550 |

Cumulative Cash Flow

|  | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| | 10,064 | (5,000) | (13,949) | (21,684) | (21,615) | 534 | (3,040) | 598 | (3,023) | (9,912) | (15,401) | 62,550 |

*Table A-1 (c) Monthly Projected Cash Flows (1999)*
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<th>39 Mar-00</th>
<th>40 Apr-00</th>
<th>41 May-00</th>
<th>42 Jun-00</th>
<th>43 Jul-00</th>
<th>44 Aug-00</th>
<th>45 Sep-00</th>
<th>46 Oct-00</th>
<th>47 Nov-00</th>
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<td>(Cash Requirements)</td>
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<td>(5,417)</td>
<td>17,635</td>
<td>92,878</td>
<td>71,612</td>
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<td>9,392</td>
<td>(13,003)</td>
<td>(714)</td>
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<td>225,301</td>
<td>202,546</td>
<td>192,264</td>
<td>186,847</td>
<td>204,483</td>
<td>297,361</td>
<td>368,973</td>
<td>376,010</td>
<td>385,403</td>
<td>372,399</td>
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<td>Ending Cash</td>
<td>225,301</td>
<td>202,546</td>
<td>192,264</td>
<td>186,847</td>
<td>204,483</td>
<td>297,361</td>
<td>368,973</td>
<td>376,010</td>
<td>385,403</td>
<td>372,399</td>
<td>371,685</td>
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<td>Cumulative Cash Flow</td>
<td>195,301</td>
<td>172,546</td>
<td>162,264</td>
<td>156,847</td>
<td>147,483</td>
<td>267,361</td>
<td>338,973</td>
<td>346,010</td>
<td>355,403</td>
<td>342,399</td>
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Table A-1 (e) Monthly Projected Cash Flows (2001)
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A-3 Projected Balance Sheet and Percentage Contrib. of Components (1997-2001)
REFERENCES

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